

Removal Completion Report

**DuSable Park
Chicago, Illinois**

April 30, 2013

Ms. Verneta Simon
US Environmental Protection Agency – Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604-3590

Subject: Removal Completion Report for DuSable Park, Chicago, Illinois, AECOM, Inc. Project No. 60222638

Dear Ms. Simon:

The enclosed report contains the finalized Removal Completion Report for the remediation of radiologically contaminated fill soil completed by AECOM Technical Services, Inc. (AECOM) at the above referenced property. Should you have any questions, please contact us at 847-279-2500.

Regards,



Brian R. Schmidt
Project Scientist II



Steven C. Kornder, Ph.D.
Senior Geochemist

AFFIDAVIT

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.

A handwritten signature in blue ink, appearing to read 'S. Kornder', with a long horizontal flourish extending to the right.

Steven C. Kornder, Ph.D.
Project Manager

Date: April 30, 2013

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1.0 Introduction

AECOM, on behalf of the Chicago Park District has developed this Removal Completion Report to document the gamma surveying and removal of radiologically contaminated fill soil from the DuSable Park Site. DuSable Park (referred to as “Site”) is an undeveloped parcel located along Chicago’s lakefront immediately north of the Chicago River. Thorium-contaminated fill soil was removed from the Site, in order to move forward with the Site’s development. The Site dimensions are approximately 500-feet by 285-feet or approximately 3.24 acres. The Site is currently vacant. There are two earthen mounds (approximately 20 feet high) located on the western portion of the Site.

This Removal Completion Report provides a summary of the remediation of radiologically contaminated fill soil previously identified as the result of radiological monitoring conducted before the implementation of the Work Plan activities. The work described in this report includes obtaining verification sign-off from USEPA for each of the exclusion zones at the Site where radiologically contaminated fill soil was remediated. The work documented was conducted in accordance with the procedures outlined in the Work Plan for Screening and Remediation of Radiologically Contaminated Fill Soil at DuSable Park (Work Plan) prepared by AECOM Technical Services, Inc. (AECOM) dated May 24, 2012, and approved by the USEPA in correspondence email dated June 1, 2012. Specifically, the known or identified radiologically-contaminated fill soils with levels of radioactivity in excess of the cleanup threshold standards set forth in the AECOM Work Plan have been removed from the Site as required by the Work Plan and signed-off by the USEPA and no further removal or cleanup action is required at this time under the Cooperative Agreement with respect to the radiologically contaminated materials on the Site. Nonetheless, if any subsequent activities at the Site involve the excavation, exposure, or intrusion of any soils 18-inches deep or deeper, those activities must be radiologically monitored and managed to ensure protection of workers and the public. A copy of the United States Environmental Protection Agency (USEPA) email to proceed with remediation and the Cooperative Agreement with City of Chicago Park District (Assistance ID No. V-00E-00755-0) dated June 7, 2011 are included in Appendix A.

2.0 Background

2.1 Site Location

The Site dimensions are approximately 500-feet by 285-feet or approximately 3.24 acres. Presently, there are two earthen mounds (approximately 20 feet high) located on the western portion of the Site. The Site is currently vacant. DuSable Park is an undeveloped parcel located along Chicago's lakefront immediately north of the Chicago River and immediately south of the Ogden Slip. The Site is presently bounded by water (seawalls) on three sides (i.e., north, east and south) and Lake Shore Drive to the west. The Site's seawalls to the south are bounded by the Chicago River and on the east and north by Ogden Slip (refer to Figure 1). The Site is located in an area of reclaimed land where fill soil material was placed along the Lake Michigan shoreline starting in the 1860's. This area of Chicago is commonly referred to as Streeterville. Redevelopment of several properties north of the Chicago River in the Streeterville neighborhood of Chicago, Illinois have been found to exhibit evidence of radiological contamination from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company (Lindsay Light).

The radiologically contaminated fill soil was originally generated as a byproduct from a former gas mantle production that used thorium nitrate in its manufacturing process. Lindsay Light facilities operated in Streeterville at 22 West Hubbard, 316 East Illinois, and 161 East Grand. The radiologically contaminated fill material was generated during the production of gas mantles, which used thorium in its manufacturing process. These manufacturing operations were conducted from the early 1900s through the early 1930s. The radiological contamination consist of elevated concentrations of thorium and their radioactive decay related daughter products in the near surface fill soils in the vicinity of the former Lindsay Light site.

Due to the proximity of this property to the Lindsay Light manufacturing facilities and documented cleanups at other properties in the Streeterville area, the USEPA, which has oversight authority for radiologically contaminated sites, requires that radiological surveys be completed prior to and during site development within the moratorium area commonly referred to as the 'Streeterville thorium investigation area'.

2.2 Site History

The 3.24 acre Site consists of reclaimed land where native lake sands and fill materials were placed beginning in the latter half of the 19th century. The Site had been developed as part of the extension of the Chicago Harbor development extending two piers out into Lake Michigan, and the Site and surrounding areas benefitted from Lake Michigan sand infill.

The Site was developed into a freight hub and also operated as a lumber and coal yard. SanbornTM fire insurance maps indicated similar property uses as coal storage until the 1950s when a paper recycling operation was present on the Site. Since the 1970s, the Site has been vacant of any structures with only shrub/scrub vegetation remaining on the Site. As of right now, the final development plans for the Site as a park have not been completed.

In 2000 the USEPA identified radioactive contamination at the Site. The USEPA completed a gamma radiation surface survey at the Site and detected elevated gamma levels indicative of thorium. A follow-

up gamma surface screening was conducted by Kerr-McGee Chemical Corporation, successor to Lindsay Light, and identified the presence of five (5) locations where radiological field measurements indicated total radium activities exceeded the USEPA Applicable Cleanup Standard of 7.1 pCi/g total radium.

In 2007, the developer of the Spire on the property immediately west of Lake Shore Drive and the Site received permission from the Chicago Park District to use the Site as a materials storage and laydown area. Re-grading of portions of the Site was necessary in order to use the Site for these purposes. The Spire project developer also built an access ramp east of Lake Shore Drive, which required excavation and re-grading of Site fill-soil. AECOM conducted radiological screening of the fill-soil during these re-grading activities. In 2007 and 2008 during construction of the access ramp, AECOM discovered four (4) additional thorium contaminated fill soil areas. AECOM remediated the two larger thorium contaminated areas in October and November 2007 as part of the ramp construction (see Figure 1). The two smaller areas with potential thorium contamination were not remediated and are identified on Figure 1 as the October 2007 (10 x 10 foot) area on the west edge of the northern fill soil mound and the March 2008 (10 x 5 foot) area at the top and western edge of the southern fill soil mound.

2.2.1 Site Lithology and Groundwater Conditions

The Site lithology urban fill material consisting of a mixture of fill, sand, silt, topsoil, and clay mixed with varying amounts of glass, brick, ash and cinder. Aerial photographs indicate that in the 1980s the northern and southern fill soil mounds were placed at the Site. The elevation of the top of the sheet pile wall is approximately +5.5 ft Chicago City Datum (CCD – note that 0 ft-CCD is approximately equivalent to 579.5 ft-msl). Thus, the elevation of the ground surface in the vicinity of the sheet pile wall is estimated at about 585 ft-msl prior to placement of the northern and southern fill soil mounds in the 1980s.

As shown on Figure 1 of the work plan, the maximum height of these unscreened northern and southern fill soil mounds, prior to Spire project re-grading activities, was about 22 feet above the original pre-1980s grade or at 607 ft-msl. During Spire project fill soil re-grading activities AECOM screened fill soils as the Spire project contractors removed them from the northern and southern mounds. AECOM confirmed that the fill soils were free of radiological contamination before the Spire contractors relocated the fill soils. The Spire project contractors did not place a barrier or marker on top of the existing fill soils before stockpiling these relocated fill soils. More specifically, the Spire project contractors relocated the western portion of the northern fill soil mound for construction of the ramp onto Lake Shore Drive and relocated a small portion of the western edge of the southern fill soil mound to facilitate better access to DuSable Park. Spire contractors staged the relocated fill soil in stockpiles on the northern and southern fill soil mounds and along Ogden slip on the north side of DuSable Park. For purposes of clarity, “mound” refers to fill soil placed in the 1980s or pre-Spire project that have not been radiologically screened, and “stockpile” refers to radiologically screened fill soil placed during the Spire project (denoted as the red and green stockpile areas on Figure 1). The soil stockpile staged along the Ogden slip on the north side of the Site was approximately 20 feet high (denoted as the blue stockpile area on Figure 1).

The volume of Spire project staged soil stockpiles is minor relative to the volume of the 1980’s north and south fill soil mounds, and since leveled, represents only a thin layer over only a portion of the 1980’s soil mounds (Figure 3). Since the Spire project contractors did not place a marker/barrier beneath the Spire stockpiles originally, radiological monitoring must be conducted during all future excavation work at the Site.

There is insufficient information to estimate the volume of fill soil material (above and below the original +5.5 ft-CCD (or 585 ft-msl)). Specifically, there is not sufficient data to determine whether the depth of fill soil below the original grade of +5.5 ft-CCD is relatively consistent across the Site. However, based on review of historical boring logs fill soils extend from original ground surface to depths ranging from -12 to -2 ft-CCD. Groundwater is approximately located between -1 to 2 ft-CCD, but is related directly to long-term river and lake levels.

2.3 Previous Radiological Survey Results.

2.3.1 Pro Source 2002 Report and Limited Site Investigation

In May 2002, Prosource Technologies, Inc. conducted a gamma radiation surface survey on the Site for Kerr McGee Chemical LLC. A June 12, 2002 report by ProSource Technologies, Inc. discussed elevated levels of thorium detected on the Site in three primary areas designated as Areas A, B and C. A copy of the June 12, 2002 report is included in Appendix B. Values encountered on the Site ranged from 7.9 to 17.7 pCi/g both of which are above the Applicable Cleanup Standard of 7.1 pCi/g.

In September 2002, Kerr McGee Chemical LLC proposed a limited removal action. It is AECOM's understanding that some remediation/removal of contaminated materials was conducted, but the total volume of contaminated material removed is not known by AECOM.

2.3.2 AECOM Surface Gamma Survey (2007)

During June and July of 2007, AECOM conducted surface surveying on portions of the Site adjacent to the seawall along the Chicago River and the Ogden Slip in areas that had been disturbed during the placement of construction fencing. No elevated levels of thorium were detected in these areas along the perimeter of the Site. Field instrumentation gamma readings ranged from 6,000 counts per minute (cpm) to 11,000 cpm. For the field instrumentation (Ludlum Model 2221 and 2 x 2 inch NaI probe), a value of 18,535 cpm was equivalent to USEPA Applicable Cleanup Standard of 7.1 pCi/g.

On July 2, 2007, USEPA revisited the three "hot-spot" locations (Areas A-C) identified by ProSource Technologies, Inc. in their 2002 investigation. Each of the areas consisted of a shallow pit filled with numerous orange sand bags, which appeared to be underlain by a sheet of black plastic. AECOM took gamma readings at the top or edges of the sand bags (i.e., the sand bags were not removed to obtain readings directly over the pit soils). Unshielded Ludlum readings obtained by AECOM at the time of the USEPA surveys appeared to confirm the USEPA field results with values ranging from 15,000 to 21,300 cpm. Figure 1 shows the hot spot locations where elevated thorium levels were originally detected in 2002. These hot spot areas were sectioned off with chain link fencing, concrete barriers, and posted with caution signs. The chain link fencing was put up by a contractor working on Spire project in 2007 and the City of Chicago Park District maintained the fencing until it was removed during the radiologically-contaminated soil remediation efforts in June 2012.

2.3.3 Lake Shore Drive Ramp Construction (2007)

Prior to the radiologically-contaminated soil remediation efforts of June 2012, there were four fill soil stockpiles located on the Site that were created during the Spire project construction activities in 2007 (refer to green, red and blue shaded areas on Figure 1). It should be noted that no marker/barrier was placed on the existing fill soils at the Site prior to the 2007 Site activities. The first, and largest, soil stockpile at the northern edge of the property along the Ogden Slip was initially created in mid-2007 when the Spire construction team created the lay-down area along the southern and east edges of the Site (refer to blue shading on Figure 1). Additional soil was placed on this stockpile during the Lake Shore Drive access ramp construction.

Three other fill soil stockpiles were also created during and following the Spire construction activities for the Lake Shore Drive access ramp in late 2007. These three fill soil stockpiles (refer to red and green shading on Figure 1) were staged on top of the original (pre-Spire) unscreened soil mounds. The stockpiles were created during the Spire project as fill soil was screened and removed from the western edges of the original northern and southern fill soil mounds. AECOM conducted radiological surveying during these Spire project soil excavation activities. Therefore, the four fill soil stockpiles at the Site, covered with tarps at the start of the June 2012 remediation activities, were previously surveyed and were free of elevated gamma activity (i.e., are below the USEPA cleanup value of 7.1 pCi/g). However, because a marker/barrier was not placed beneath these radiologically screened Spire stockpiles and the pre-existing 1980s vintage unscreened soil mounds, future excavation work will need to be completed in consultation with the EPA. Specifics regarding the radiological screening and remediation activities during the Spire project are summarized in the following paragraphs. AECOM screened approximately one-half (by volume) of the original northern fill soil mound in October/November of 2007 during the construction of a Lake Shore Drive access road ramp structure along the northwest side of DuSable Park. These activities were conducted following a scope of work submitted to the USEPA by AECOM in October 2007. It is believed by AECOM that the original northern and southern fill soil mounds were placed at the Site in the 1980s. The surface of these fill soil mounds was gamma surveyed by Kerr McGee Chemical LLC in 2002 (refer to Appendix A of the work plan).

Construction activities for the ramp required the excavation of the westernmost portion of the soil mound on the northern half of DuSable Park, as well as the excavation of approximately 6 feet of soil below the historical/original grade of DuSable Park (estimated at +5.5 feet Chicago City Datum (CCD)). Radiologically contaminated fill materials that exhibited elevated gamma readings over the field instrument equivalent to the USEPA Applicable Cleanup Standard of 7.1 pCi/g was removed by AECOM from the excavation and placed directly in one-cubic yard super-sacks. Approximately 26.5 (one-cubic yard) super-sacks were filled and placed into 3 “Baker Box” containers. The remaining space of the 3rd Baker Box and 2 additional Baker Boxes (the 4th and 5th) were filled directly with radiologically contaminated fill soil. A 6th Baker Box was filled directly with concrete contaminated by the surrounding radiologically contaminated fill soil. Gamma spectroscopy results for a sample collected by the USEPA and analyzed for AECOM at RSSI Laboratories (RSSI) indicated a total radium concentration of approximately 170 pCi/g. NUTRANL analysis of soil samples that were also collected from the contaminated areas prior to excavation/remediation indicated total radium concentrations ranging from 39.5 to 4,783 pCi/g total radium (refer to Appendix B). Verification samples taken by the USEPA after the remediation conducted by AECOM showed total radium activities of 3.48 and 5.32 pCi/g. As a result, the USEPA released these exclusion zone areas for construction. A copy of a ramp remediation results report (STS, October 2007) along with copies of the USEPA verification sample NUTRANL results, USEPA sign-offs, gamma spectroscopy reports, personal air monitoring, high volume air monitoring, overburden soil stockpile sampling results, equipment release and shipping manifests are also included in Appendix B. The transportation and arrangements for disposal at EnergySolutions (Clive, UT) were conducted by Tronox, Inc. (formerly part of Kerr-McGee before 2006 spinoff). As such, details with respect to disposal beyond that found on the manifests were not provided to AECOM.

Finally, a small area of contaminated soil at the east end of East North Water Street was remediated by AECOM in November of 2007. This area was essentially in the middle the street near Area B (refer to Figure 1). This area was remediated since the volume was small and there was room in the Baker Boxes used for the ramp remediation. The area was remediated on November 16, 2007 and released by the USEPA the next day. A copy of the verification sampling form has been included in Appendix B.

Thus, a total of six (6) Baker Boxes, comprising approximately a total of 70 cubic yards of contaminated materials was remediated. This material was manifested and transported offsite on November 27, 2007 by Tronox to EnergySolutions.

AECOM discovered a small area with elevated gamma readings (approximately 70,000 cpm) while conducting soil screening for the construction access road on March 10, 2008. The area was located at the western edge of the southern mound about 6 feet below the original mound surface (i.e., within the mound fill/soil material). Investigation of the area immediately surrounding the spot indicated that the elevated readings appeared confined to an area approximately two square feet in size. A radiological soil investigation of the area performed by AECOM personnel indicated that elevated readings were confined to what appeared to be a fist-sized piece of the material. Because of the limited size, the material was placed in a super-sack along with some of the soil surrounding the object (less than ½ cubic yard). Gamma readings after removal of the contaminated soil materials were approximately 9,500 to 12,000 cpm, which is less than the instrument equivalent to the 7.1 pCi/g value of 19,017 cpm. The fist-size piece of material was submitted for gamma spectroscopy analysis (sample S/3-4). The results of the analysis (446 pCi/g total Ra) were submitted to the USEPA via email on March 14, 2008. On March 19, 2008, the USEPA visited the Site and screened the area. The USEPA indicated that the location (grid S/3-4) where the single piece of material with elevated gamma readings was discovered would not be considered an exclusion zone. Therefore, no verification sampling was necessary and additional soil excavation and gamma screening could proceed at this location. Pursuant to USEPA request, the sample was forwarded to the USEPA contract laboratory.

AECOM screened an area of the southern mound in March of 2008 for the installation of an access road to the above described ramp to mid-level Lake Shore Drive. The radiological screening was conducted following a scope of work submitted to the USEPA by AECOM in December 2007. An area on the western side of the southern mound approximately 20-feet wide was excavated and screened for thorium contamination. The length of the area excavated for the access road was approximately 80 feet. On March 25, 2008, a small area was discovered with gamma readings at or slightly above the gamma meter cutoff threshold. The area was discovered while cutting back the western edge of the southern soil mound for a ramp access road per the December 20, 2007 scope of work plan. The majority of the gamma readings recorded ranged from approximately 18,000 cpm to 23,000 cpm (value equivalent to 7.1 pCi/g was 19,017 cpm). The area is located near the top of the southern mound at its western edge. That same day, the area (about 5 x 10 feet) was fenced with orange snow-fence and radiological warning placards were attached to the fence (refer to Figure 1). Remediation of this area was not performed since it did not interfere with the construction or the use of the new ramp access road. Remediation of this area was performed by AECOM along with the remediation of the other historical soil hot spots in June 2012.

3.0 Radiological Surveying and Removal Activities

Field activities included the removal of the radiologically contaminated fill identified during previous surveying efforts performed onsite. Specifically, this included a previous surface survey performed by Pro Source/Kerr McGee Chemical LLC in 2002, and 2 areas identified during the 2007 Lake Shore Drive ramp construction by AECOM. The remaining sections of this report document the radiological surveying activities and the removal actions conducted as generally outlined in the Work Plan (AECOM, May 2012). The remediation related activities covered by this report were performed between June 4, 2012 and June 12, 2012. As this report explains, all known radioactive contamination identified by radiological surveys of surface soils was removed during this project. However, radiological surface surveys cannot detect thorium shielded by 18-inches or more of soil or other overburden such as asphalt or concrete. Consequently, although the surface soils at the Site have been radiologically surveyed and all radioactive contamination removed, there may be buried contaminated soils remaining. For that reason, in the future it will be necessary to radiologically monitor and manage all subsurface soils deeper than 18 inches to protect workers and the public.

3.1 Site Work Documented Through Daily Progress Reports

The work completed in the course of this report was documented by AECOM personnel through daily progress reports submitted to USEPA. These progress reports described the work completed each day, and described the work planned for the following day. The soil analyses for the verification samples were submitted with the request for USEPA sign-off of successful remediation and therefore were not included with the daily progress reports. The daily reports are on file with USEPA and are not included as an attachment in this Removal Completion Report.

3.2 Removal Procedures for Radiologically Contaminated Fill Soils

3.2.1 USEPA Cleanup Level

The cleanup limit established for Chicago's Streeterville area by USEPA is 5 pCi/g of total radium (Ra-226 + Ra-228) above the background radium activity. The background total radium activity for the area is specified by USEPA as 2.1 pCi/g. Thus, the cleanup threshold for the Site was established at 7.1 pCi/g total radium.

3.2.2 Safety Training and Communications

AECOM provided Site and project specific radiation and health and safety training to the on-site personnel prior to the start of remediation work on the Site. Training included discussion of radiation basics, anticipated hazards, equipment to be worn, safety practices to be followed, contamination prevention practices, and emergency procedures as well as a discussion of the site-specific Health and Safety Plan (HASP). Training was conducted by field team leader Brian Schmidt (AECOM) and health physicist Glenn Huber (Stan A. Huber Consultants, Inc. - SAHCI). A copy of the training attendance sheet is included in Appendix C.

3.2.3 Remedial Actions

The excavation of the radiologically contaminated fill soil was initiated by AECOM on June 4, 2012. The excavation contractor was R.W. Collins Company of Chicago, Illinois. Remediation activities consisted exclusively of the excavation of radiologically contaminated fill soil found in the previously identified areas of the Site (see Figure 1). The only individual to work in the exclusion zone was the health physicist Glenn Huber (SAHCI). The excavator, with the exception of the bucket, and the remainder of the personnel were kept outside of the exclusion zone.

The initial excavation of radiologically contaminated fill soil occurred on June 4, 2012 at “Area C” in the southern portion of the Site (refer to Figure 1). Radiologically contaminated soils were placed directly into super-sacks with approximately a 3.5 cubic yard volume. A total of 7 – 3.5 cubic yard super-sacks were filled during “Area C” remediation. The excavation was approximately 20-feet wide by 27-feet long. Excavation determined that the contaminated fill soils ranged in depth between 1.5-feet to 3-feet below ground surface.

After the excavation of “Area C” was remediated to a level below the applicable cleanup standard, excavation efforts of radiologically contaminated fill soil were performed at “Area A” on June 5, 2012. “Area A” is located in the northeast portion of the Site (refer to Figure 1). Radiologically contaminated soils were placed directly into the 3.5 cubic yard super-sacks. A total of 7 – 3.5 cubic yard super-sacks were filled during the “Area A” remediation. The excavation was approximately 28-feet wide by 33-feet long. Excavation determined that the contaminated fill soils ranged in depth between 1-foot to 3-feet below ground surface.

On June 6, 2012, AECOM excavated soils in the northwest portion of the Site (refer to Figure 1) where an area of elevated gamma readings was originally detected by AECOM personnel in October 2007 during construction of the Lake Shore Drive on ramp. The area was designated as “Area D” (refer to Figure 2). This area was only a couple of square feet in size when discovered in October 2007. Gamma readings were between 19,100 and 22,000 cpm (versus the meter threshold of 18,740 cpm). Since no additional soil removal was required for ramp construction, the area was not excavated along with the other remediation activities conducted in the fall of 2007. Screening and probing with a hand shovel later that fall by STS (now AECOM) did not reveal values above the Ludlum threshold (i.e., there did not appear to be any contaminated fill soil that could be excavated even with a hand shovel). However, since the area was not fully investigated (i.e., dug up) it was left as an exclusion zone. The radiological survey investigation of “Area D” in June 2012 yielded no evidence of radiologically contaminated soils above the applicable cleanup standard. The investigation included an excavation that was approximately 14-feet wide by 30-feet long to a depth of 2-feet below ground surface. As a result, no super-sacks were filled at this location.

Excavation efforts shifted to the March 2008 area (refer to Figure 1) just south of “Area B” during the afternoon of June 6, 2012. This area was discovered during construction activities along the western slope of the southern soil mound in March 2008. During remediation activities, the size of the March 2008 exclusion zone grew larger and ultimately ended up tying into the previously identified locations of “Area B2” as well as “Area B3”. On Friday June 8, 2012 work moved to Area B3 with gamma readings between 19,100 and 37,000 cpm for most of the excavation. Early in the afternoon, a 1 X 1 foot and 1-inch thick piece of material was found by AECOM personnel in the southeast corner of the excavation. Gamma readings for this material had a maximum of 720,000 cpm. AECOM notified USEPA immediately of the discovery and the USEPA arrived onsite in the mid-afternoon to examine the material, which was able to be broken into smaller pieces and placed in a gallon Ziploc bag inside the super-sack for the area. USEPA requested AECOM analyze this material by high resolution gamma

spectroscopy and then transfer the sample to the USEPA contract lab for analysis (Appendix D-3). The sample (B3-HS1) was submitted to RSSI in Morton Grove, Illinois. A copy of the results is included in Appendix D1, which indicated a total radium activity of 763 pCi/g. In summary, between June 6 and 11, 2012, radiological soil remediation was performed on a 70-foot long by 33-foot wide excavation that encompassed the entire areas of “March 2008”, “Area B2” and “Area B3”. Excavation determined that the contaminated fill soils ranged in depth between 1-foot and 4-feet below ground surface. A total of 18 – 3.5 cubic yard super-sacks were filled during the remediation efforts at this location.

On June 12, 2012, radiologically contaminated fill soil was excavated at “Area B1” in the western portion of the Site (refer to Figure 1). Radiologically contaminated soils were placed directly into super-sacks with approximately a 3.5 cubic yard volume. A single 3.5 cubic yard super-sack was filled during the “Area B1” remediation. The excavation was approximately 15-feet wide by 30-foot long. Excavation determined that the contaminated fill soils were identified at a depth of approximately 2-feet below ground surface.

At the end of each work day, AECOM fenced off the exposed excavation and the appropriate radiological placards were applied to the fencing in accordance with proper USEPA and Work Plan protocol. The super-sacks were tied and placed at a designated staging area onsite to await removal to the designated waste facility. The last super-sack of radiologically contaminated fill soil was excavated on June 12, 2012.

A total of 33 super-sacks of radiologically contaminated material were loaded during this removal action. NUTRANL analyses for a composite for each super-sack were conducted for manifesting purposes and are provided in Appendix D. The NUTRANL results for the individual super-sack composite samples averaged 11.4 pCi/g total radium with a maximum activity of 44 pCi/g total radium. Soils removed consisted of brown-black fill soils with small amounts of brick/concrete debris.

During the remediation process clean overburden fill soils from the exclusion zone based on field screening were stockpiled adjacent to the exclusion zone. This overburden was field screened to confirm that the material could be backfilled into the excavation once the exclusion zone had been released by the USEPA. Thus, the overburden could be utilized on-site as excavation backfill.

3.2.4 Verification of Successful Remediation

For the USEPA verification survey, each of the six exclusion zone areas (Area A, Area B1, Area B2, Area B3 (which included the March 2008 area), Area C and Area D (October 2007 area) were divided into four quadrants of approximately equal areas. Five samples were collected for the verification survey area (one sample from each of four quadrants and the fifth sample from the center of the area). These samples were combined to form a single composite sample. In accordance with the Work Plan SOP-210, the composite sample was homogenized by mixing the soil in a clean steel bowl, screened to minus ¼-inch, and five sub-samples (sample splits) were generated for radiological analysis. If the average of these five sub-samples was found by AECOM to be less than the cleanup threshold of 7.1 pCi/g total radium, a notice of successful verification form was prepared by AECOM for USEPA signature. The supporting analytical data and verification forms were faxed to USEPA. After receipt and review, the USEPA signed the form and returned a faxed copy to AECOM, thus releasing the area for backfilling.

Verification sampling of the six exclusion zone areas was conducted on June 12, 2012, by the USEPA and subsequently released on June 13, 2012. Copies of the signed successful verification forms are provided in Appendix E.

3.3 Post Remediation Gamma Surveying

3.3.1 Geotechnical Soil Boring Surveys

Engineering design activities by the Chicago Department of Transportation (CDOT) for a new elevated bike path required a geotechnical soil boring investigation at pre-determined boring locations on June 13, 2012. A total of 5 borings were performed by Strata Earth Services, LLC to depths down to native sand (approximately 12.5-feet bgs) along the western perimeter of the Site adjacent to Lake Shore Drive. AECOM personnel surveyed the drilling spoils (tailings) created during the drilling investigation. The fill soil for each soil boring location consisted of brown to black colored sand to gravel size material with cinders, ash and brick/concrete debris. Measurements of the geotechnical soil boring locations indicated gamma readings that ranged from 3,300 to 7,000 counts per minute (cpm), which is below the unshielded Ludlum threshold value of 19,969 cpm that is equivalent to the USEPA cleanup value of 7.1 pCi/g total radium. As a result, no indications of radiologically-contaminated fill above the USEPA clean threshold were observed.

4.0 Quantity of Radiologically Contaminated Fill Soil Removed

On September 19 and 20, 2012, a total of seven flatbed trucks transported the radiologically contaminated material for disposal at Waste Control Specialists, LLC in Andrews, Texas. AECOM loaded five trucks with 5 super-sacks on each and two trucks with 4 super-sacks on each. Copies of the manifests and certificates of disposal are included in Appendix F. The material was transported for disposal by I.C.E. Services, Inc. of Ambridge, Pennsylvania to Waste Control Specialists, LLC in Andrews, Texas.

A total of 33 super-sack bulk material bags, each containing approximately 3.5 cubic yards of radiologically contaminated fill soil, were removed from Site during the remediation that was conducted between June 4 and 12, 2012. Therefore, the total volume of contaminated fill soil remediated was approximately 115.5 cubic yards. The weight of the radiologically contaminated fill soil is estimated to be about 3.4 tons per container based on measured weights. This was slightly less measured during previous removal efforts at other sites due to the extremely dry conditions. Therefore, a total weight of approximately 112 tons was shipped off-site for disposal. The cost to conduct the remedial activities was approximately \$224,200 of which \$40,000 was spent for pre and post remediation work plans and documentation, \$96,700 on remediation labor, supplies and equipment and \$87,500 on waste transportation and disposal.

5.0 Radiologically Contaminated Fill Remaining On-Site

No known radiologically contaminated fill remains on the Site. Until park development plans have been finalized, the extent of future on-site excavation will not be known. However, if any subsequent activities at the Site involve the excavation, exposure, or intrusion of any soils 18 inches deep or deeper, those activities must be radiologically monitored and managed to ensure protection of workers and the public

6.0 Post-Removal Activities

After all known onsite areas of radiologically-contaminated soils were remediated in June 2012, work continued with Site re-grading activities of the four previously radiologically surveyed soil stockpiles that were created during the Spire project in 2007 (Figure 1). Between June 13 and 14, 2012, AECOM was onsite to observe these grading activities. As directed by the Chicago Park District, the tarps were removed from the previously screened soil stockpiles. The tarps were badly damaged and were no longer effectively serving as a cover. The soil stockpiles were flattened and contoured to facilitate the installation of a vegetative cover. The grading activity created approximately 1 or 2 feet of additional cover over the original elevations in the immediate vicinity of the soil stockpiles. Some of the stockpiled soil was also used to backfill the excavations created during the radiologically contaminated soil remediation efforts. The horizontal extent of the re-contoured soil stockpiles are shown in Figure 3. Approximately 720 cubic yards of topsoil was imported and the soil stockpiles, as well as other areas of the Site with sparse vegetation (including the hot spot excavation areas), were covered with approximately 3 to 4 inches of topsoil. These areas were then hydro-seeded with a native seed mix (Little Bluestem, Sideoats Grama, Canada Wild Rye & Prairie Dropseed with several Ryegrasses for cover crop). This vegetative cover installation was completed in November 2012.

7.0 Difficulties Encountered

Only minor difficulties were encountered during the surveying or remediation of radiologically contaminated fills. The difficulties primarily included high temperatures encountered during two of the days and resulted in accounting for slightly increased water hydration breaks. However, ultimately none of these difficulties impacted the completion of the project.

8.0 Analytical Results

8.1 Soil Sample Radiological Analytical Results

Soil samples collected during the remediation process were analyzed by Glenn Huber (SAHCI) by the NUTRANL analysis methodology to document the concentrations of the target cleanup radionuclides. The NUTRANL analyses for the samples are presented in Appendix D by laboratory number, which is also chronological. Samples collected for verification purposes by the USEPA were analyzed first by SAHCI and then transferred to the USEPA under chain-of-custody.

8.1.1 USEPA Verification Sample

The seven original exclusion zones were divided into six verification areas (Area A, Area B1, Area B2, Areas B3 and March 2008, Area C and Area D (aka October 2007)). Verification sampling of the post remediation portion of the exclusion zones was conducted on June 12, 2012, by the USEPA and subsequently released by USEPA on June 13, 2012. In each of the exclusion zone areas, five samples were collected to create a composite for each area (i.e., one sample from each of four quadrants and a fifth from approximately the center). The five samples forming the composite were then homogenized (mixed in a clean steel bowl) and five sub-samples were prepared.

Results for the five sub-samples taken in:

- “Area A” ranged from 3.61 to 5.96 pCi/g with an average activity of 4.87 pCi/g total radium;
- “Area B1” ranged from 2.97 to 4.21 pCi/g with an average activity of 3.60 pCi/g total radium;
- “Area B2” ranged from 2.76 to 4.38 pCi/g with an average activity of 3.62 pCi/g total radium.
- “Area B3” and the October 2008 area ranged from 2.02 to 3.69 pCi/g with an average activity of 2.76 pCi/g total radium;
- “Area C” results ranged from 4.23 to 5.84 pCi/g with an average activity of 4.85 pCi/g total radium; and
- “Area D” (aka October 2007 area) ranged from 1.61 to 3.43 pCi/g with an average activity of 2.51 pCi/g total radium.

Since the average of the five sub-samples for each of the six verification areas were found to be less than the cleanup threshold of 7.1 pCi/g total radium, a successful verification form was prepared for USEPA signature. The supporting data and verification form were both faxed to USEPA for review and sign-off. The NUTRANL results of the USEPA verification samples are included with copies of the signed notification of successful verification form in Appendix E. The verification samples were transferred to USEPA under chain-of-custody for analysis at its contract laboratory. This data will be inserted in Appendix D upon completion of the analysis and receipt of the data from the USEPA.

8.2 Equipment Release Surveys

Excavating equipment used in the excavation of radiologically contaminated fill was required to be surveyed to confirm the equipment was free of radiological contaminants prior to being released from the Site. This equipment was limited to the excavation bucket used to excavate and load the contaminated fill. The remainder of the excavator was not used within the exclusion zones. To confirm the absence of

contaminants, the treads and other portions of the equipment where soil had accumulated, were surveyed for contamination as well by Glenn Huber (SAHCI).

For the excavator buckets, wipes were also taken in accordance with Work Plan SOP-45, and alpha counts were made to confirm the absence of contamination. The limits listed in SOP 345 were those of 32 IAC 340 Appendix A ($33 \text{ dpm}/100 \text{ cm}^2$). However, in practice with “as low as reasonably achievable” (ALARA), the most restrictive federal level of $20 \text{ dpm}/100 \text{ cm}^2$ for removable contamination from Table 1 of the Nuclear Regulatory Commission’s Regulatory Guide 1.86 was used for equipment release. A copy of the alpha count survey results were well below this most restrictive level and are included in Appendix G.

8.3 Perimeter Air Monitoring

Excavation area high volume air monitoring for airborne radioactivity was conducted by Glenn Huber (SAHCI) whenever excavation of radiologically contaminated fill was being conducted. The Site is sufficiently large so that the monitoring at the perimeter would not characterize the potential airborne contaminants from work at discrete locations within the Site. Therefore, air monitoring locations were established along the perimeters of the excavation areas. Thus, the widespread distribution of the exclusion zone activities necessitated that area air monitoring equipment be repositioned for each excavation to comply with the air monitoring plan.

The air samples were analyzed the day after the collection and again after four days to allow for the short-lived progeny to decay. The daily and weekly air concentrations were compared to the most limiting effluent concentration limit for thorium-232, which is $4\text{E-}15 \text{ }\mu\text{Ci}/\text{ml}$ based on 10 CFR Part 20 Appendix B Table 2 (Effluent Concentration Limits). No exceedances of the exposure limit for the Site perimeter were documented for any day of monitoring. The high volume air monitoring results are provided in Appendix H.

8.4 Personal Air Monitoring

Personal air monitoring (PAM) was conducted for persons working in exclusion zones. As stated previously, because of the limited size and short duration of the remediation efforts the only individual to work in the exclusion zone was the health physicist Glenn Huber (SAHCI). A personal air monitor was also given to the R.W. Collins Company laborer to also confirm the absence of allowable exposure limits outside of the exclusion zone areas. PAM data for radioactivity for both one-day and four-day analyses are included in Appendix H. These data show no exceedance of the allowable exposure limits for this project.

9.0 Summary and Conclusions

The work documented in the DuSable Park Removal Completion Report was conducted in accordance with the AECOM Work Plan and USEPA Cooperative Agreement with City of Chicago Park District (Assistance ID No. V-00E-00755-0) dated June 7, 2011. The work described in this DuSable Park Removal Completion Report was conducted with the procedures outlined in the Work Plan for Screening and Remediation of Radiologically Contaminated Fill Soil at DuSable Park prepared by AECOM dated May 24, 2012 and approved by the USEPA in a correspondence email dated June 1, 2012.

This DuSable Park Removal Completion Report provides a summary of the remediation of radiologically contaminated fill soil previously identified as the result of radiological monitoring conducted before the implementation of the Work Plan activities. The work described in this report includes documenting the remediation methods, disposal record as well as obtaining verification sign-off from USEPA for each of the exclusion zones at the Site where radiologically contaminated fill was remediated.

In conclusion, this DuSable Park Removal Completion Report and the work described herein meet the work requirements of the June 7, 2011, Cooperative Agreement with City of Chicago Park District. Specifically, the known or identified radiologically contaminated fill soils with levels of radioactivity in excess of the cleanup threshold standards set forth in the AECOM Work Plan have been removed from the Site as required by the Work Plan and signed-off by the USEPA. As a result, AECOM, on behalf of the City of Chicago Park District, requests acceptance by the USEPA of the Removal Completion Report for the DuSable Park Site.

10.0 References

Pro Source (June 12, 2002) DuSable Park Limited Site Investigation, Chicago Illinois, Pro Source Project No. 386-00.

STS (December 12, 2007) Summary of Radiological Investigation at DuSable Park, Chicago Illinois, STS Project No, 200702842.

USEPA (June 7, 2011) Cooperative Agreement with City of Chicago Park District (Assistance ID No. V-00E-00755-0)

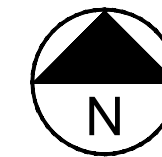
AECOM (May 24, 2012) Work Plan for Screening and Remediation of Radiologically Contaminated Fill Soil at DuSable Park, Chicago, Illinois, AECOM Project No, 60222638.

Figure 1

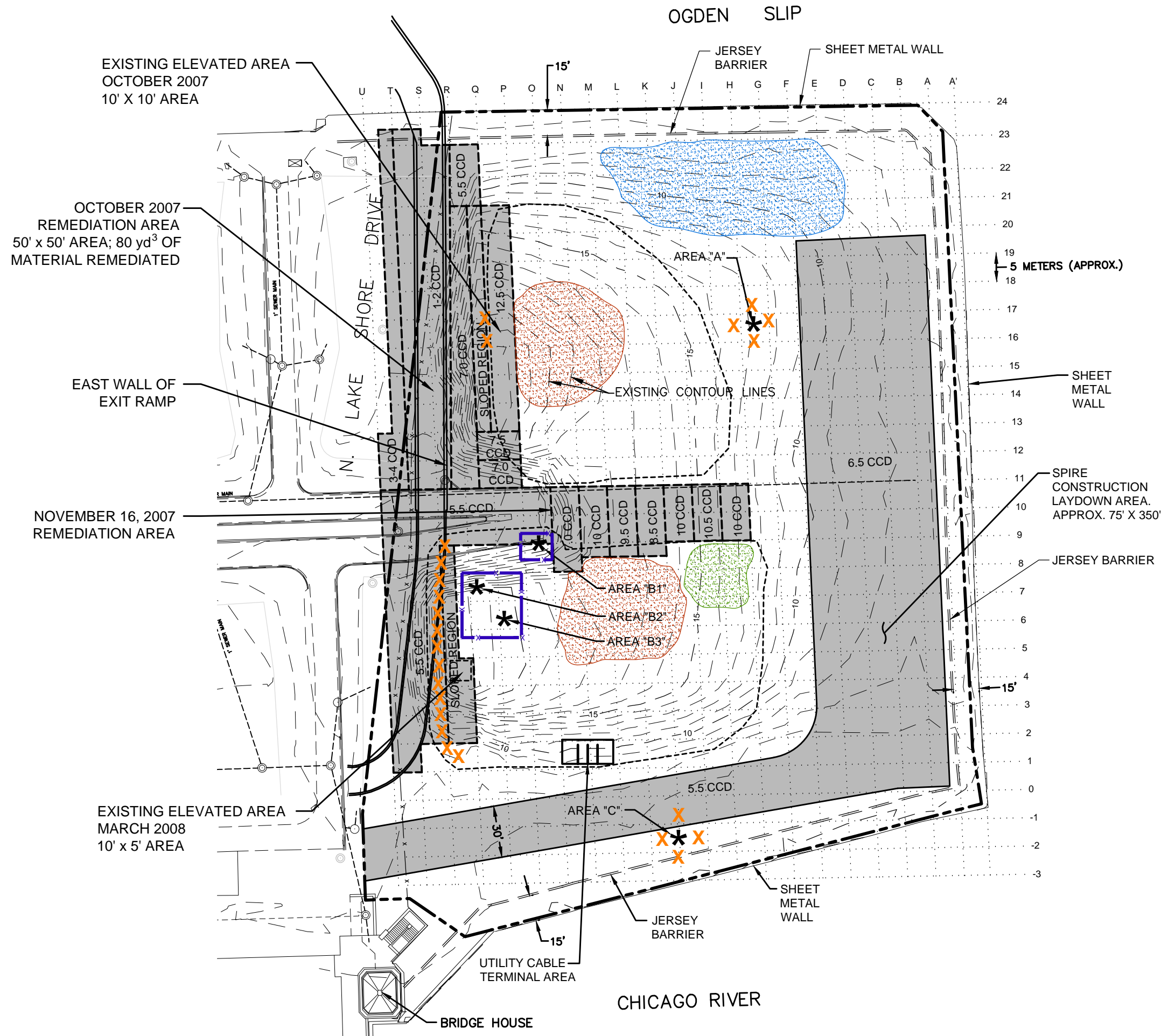
**Pre-Radiological Soil
Remediation Site
Conditions Map -
DuSable Park**

CURRENT SITE CONDITIONS MAP - FEBRUARY 2009
DUSABLE PARK SITE
CHICAGO, ILLINOIS

OGDEN SLIP



0 60
1" = 60'



NOTE:

1. AT GRADE, SURFACE SURVEY COMPLETED ON ENTIRE SITE DATED JULY 2007
2. CCD=CHICAGO CITY DATUM

LEGEND

- CONSTRUCTION LAYDOWN AREA
- PROPERTY LINE
- CONTOUR LINE (CCD)
- CHAIN LINK FENCE
- SNOW FENCING AROUND MOUND PERIMETER
- 2002 THORIUM TEST PIT
- JERSEY BARRIER
- RADIOLOGICAL SURVEY GRID
- AREAS SCREENED TO SPECIFIED DEPTH
- APPROX. 20' HIGH STOCKPILE OF RADIOLOGICALLY SURVEYED FILL/SOIL ABOVE ORIGINAL GRADE
- APPROX. 10' HIGH STOCKPILE OF RADIOLOGICALLY SURVEYED FILL/SOIL ABOVE ORIGINAL GRADE
- APPROX. 20' HIGH STOCKPILE OF RADIOLOGICALLY SURVEYED FILL/SOIL ABOVE ORIGINAL GRADE
- JERSEY BARRIERS WITH ORANGE PERIMETER

Drawn : SAE 4/11/2013

Checked: SCK 4/11/2013

Approved: SCK 4/11/2013

PROJECT NUMBER 60222638

FIGURE NUMBER 1.0

Figure 2

**Site Aerial and Post-
Radiological
Remediation Locations
Map – DuSable Park**



DESIGNED BY:		NO.:		REVISIONS	
DRAWN BY:		NO.:		DESCRIPTION:	DATE:
ML					
CHECKED BY:					
SCK					
APPROVED BY:					
SCK					

AECOM
27755 Diehl Road
Warrenville, Illinois 60555
Phone: (630) 836-1700
Fax: (630) 836-1711
Web: <http://www.aecom.com>

AECOM

DuSable Park Thorium Remediation Areas Chicago, Illinois		
SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	01/03/13	60222638.2.1

FIGURE NUMBER
2
SHEET NUMBER

Figure 3

**Extent of Re-graded
Soil Stockpiles Map –
DuSable Park**

Appendix A

USEPA Agreement and Correspondence



U.S. ENVIRONMENTAL PROTECTION AGENCY

Cooperative Agreement

ASSISTANCE ID NO.

PRG	DOC ID	AMEND#
V	00E00755	- 0

DATE OF AWARD
06/07/2011

TYPE OF ACTION
New

MAILING DATE
06/14/2011

PAYMENT METHOD:
ASAP

ACH#
50742

RECIPIENT TYPE:
Special District

Send Payment Request to:
Las Vegas Finance Center

RECIPIENT:

PAYEE:

Chicago Park District 451 N. Fairbanks Chicago, IL 60605 EIN: 36-6005822

Chicago Park District 451 N. Fairbanks Chicago, IL 60611
--

PROJECT MANAGER

Daniel Cooper 451 N. Fairbanks Chicago, IL 60605 E-Mail: dan.cooper@chicagoparkdistrict.com Phone: 312-742-4287

EPA PROJECT OFFICER

Isalee Coleman 77 West Jackson Blvd., SE-5J Chicago, IL 60604-3507 E-Mail: Coleman.Isalee@epa.gov Phone: 312-886-7597

EPA GRANT SPECIALIST

Donna Stingley Assistance Section, MC-10J E-Mail: Stingley.Donna@epa.gov Phone: 312-353-1677

PROJECT TITLE AND DESCRIPTION

DuSable Park Remediation Project

The Chicago Park District (CPD) will proceed with removal of previously identified thorium contaminated materials at the DuSable Park Site. CPD will remove and dispose of the thorium contaminated materials from these hot spots and further evaluate the site for any additional thorium contaminated material. The goal of the project will be to complete all remediation work necessary to move forward with development of the park space.

BUDGET PERIOD

06/15/2011 - 06/15/2016

PROJECT PERIOD

06/15/2011 - 06/15/2016

TOTAL BUDGET PERIOD COST

\$255,822.00

TOTAL PROJECT PERIOD COST

\$255,822.00

NOTICE OF AWARD

Based on your application dated 03/24/2011, including all modifications and amendments, the United States acting by and through the US Environmental Protection Agency (EPA), hereby awards \$255,822. EPA agrees to cost-share 100.00% of all approved budget period costs incurred, up to and not exceeding total federal funding of \$255,822. Such award may be terminated by EPA without further cause if the recipient fails to provide timely affirmation of the award by signing under the Affirmation of Award section and returning all pages of this agreement to the Grants Management Office listed below within 21 days after receipt, or any extension of time, as may be granted by EPA. This agreement is subject to applicable EPA statutory provisions. The applicable regulatory provisions are 40 CFR Chapter 1, Subchapter B, and all terms and conditions of this agreement and any attachments.

ISSUING OFFICE (GRANTS MANAGEMENT OFFICE)

ORGANIZATION / ADDRESS

U.S. EPA Region 5 Mail Code MCG10J 77 West Jackson Blvd. Chicago, IL 60604-3507
--

AWARD APPROVAL OFFICE

ORGANIZATION / ADDRESS

U.S. EPA, Region 5 Superfund Division 77 West Jackson Blvd., S-6J Chicago, IL 60604-3507

THE UNITED STATES OF AMERICA BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY

SIGNATURE OF AWARD OFFICIAL

Digital signature applied by EPA Award Official

TYPED NAME AND TITLE

Cyndy Colantoni, Associate Director for Resources Management
--

DATE

06/07/2011

AFFIRMATION OF AWARD

BY AND ON BEHALF OF THE DESIGNATED RECIPIENT ORGANIZATION

SIGNATURE

<i>Michael P. Kelly</i>

TYPED NAME AND TITLE

Timothy J. Mitchell, General Superintendent and CEO

DATE

MICHAEL P. KELLY

KS
7/6/11

V - 00E00755 - 0 Page 2

FUNDS	FORMER AWARD	THIS ACTION	AMENDED TOTAL
EPA Amount This Action	\$	\$ 255,822	\$ 255,822
EPA In-Kind Amount	\$	\$	\$ 0
Unexpended Prior Year Balance	\$	\$	\$ 0
Other Federal Funds	\$	\$	\$ 0
Recipient Contribution	\$	\$	\$ 0
State Contribution	\$	\$	\$ 0
Local Contribution	\$	\$	\$ 0
Other Contribution	\$	\$	\$ 0
Allowable Project Cost	\$ 0	\$ 255,822	\$ 255,822

Assistance Program (CFDA)	Statutory Authority	Regulatory Authority
66.802 - Superfund State Political Subdivision and Indian Tribe Site Specific Cooperative Agreements	CERCLA: Sec. 104(d)(1)	40 CFR PTS 31 & 35 SUBPT O

Fiscal									
Site Name	Req No	FY	Approp. Code	Budget Organization	PRC	Object Class	Site/Project	Cost Organization	Obligation / Deobligation
LINDSAY	1105SKX015	11	TR2	05F00YT	302DC6E	4185	05YTRV00	C001	255,822
									255,822

Table A - Object Class Category (Non-construction)	Total Approved Allowable Budget Period Cost
1. Personnel	\$0
2. Fringe Benefits	\$0
3. Travel	\$0
4. Equipment	\$0
5. Supplies	\$0
6. Contractual	\$255,822
7. Construction	\$0
8. Other	\$0
9. Total Direct Charges	\$255,822
10. Indirect Costs: % Base	\$0
11. Total (Share: Recipient <u>0.00</u> % Federal <u>100.00</u> %.)	\$255,822
12. Total Approved Assistance Amount	\$255,822
13. Program Income	\$0
14. Total EPA Amount Awarded This Action	\$255,822
15. Total EPA Amount Awarded To Date	\$255,822

Administrative Conditions

1. FISCAL YEAR 2011 ACORN FUNDING RESTRICTIONS

Congress has prohibited EPA from using its FY 2011 appropriations to provide funds to the Association of Community Organizations for Reform Now (ACORN) or any of its subsidiaries. None of the funds provided under this agreement may be used for subawards/subgrants or contracts to ACORN or its subsidiaries. Recipients should direct any questions about this prohibition to their EPA Grants Management Office.

2. CONSULTANT CAP

Payment to consultants. EPA participation in the salary rate (excluding overhead) paid to individual consultants retained by recipients or by a recipient's contractors or subcontractors shall be limited to the maximum daily rate for a Level IV of the Executive Schedule (formerly GS-18), to be adjusted annually. This limit applies to consultation services of designated individuals with specialized skills who are paid at a daily or hourly rate. As of January 1, 2011, the limit is \$596.00 per day and \$74.50 per hour. This rate does not include transportation and subsistence costs for travel performed (the recipient will pay these in accordance with their normal travel reimbursement practices).

Subagreements with firms for services which are awarded using the procurement requirements in 40 CFR 30 or 31, as applicable, are not affected by this limitation unless the terms of the contract provide the recipient with responsibility for the selection, direction, and control of the individuals who will be providing services under the contract at an hourly or daily rate of compensation. See 40 CFR 31.36(j) or 30.27(b).

3. COPYRIGHTED MATERIAL

In accordance with 40 CFR 31.34 for State, local and Indian Tribal governments or 40 CFR 30.36 for other recipients, EPA has the right to reproduce, publish, use, and authorize others to use copyrighted works or other data developed under this assistance agreement for Federal purposes.

Examples of a Federal purpose include but are not limited to: (1) Use by EPA and other Federal employees for official Government purposes; (2) Use by Federal contractors performing specific tasks for the Government; (3) Publication in EPA documents provided the document does not disclose trade secrets (e.g. software codes) and the work is properly attributed to the recipient through citation or otherwise; (4) Reproduction of documents for inclusion in Federal depositories; (5) Use by State, tribal and local governments that carry out delegated Federal environmental programs as "co-regulators" or act as official partners with EPA to carry out a national environmental program within their jurisdiction and; (6) Limited use by other grantees to carry out Federal grants provided the use is consistent with the terms of EPA's authorization to the other grantee to use the copyrighted works or other data.

Under Item 6, the grantee acknowledges that EPA may authorize another grantee(s) to use the copyrighted works or other data developed under this grant as a result of:

- a. the selection of another grantee by EPA to perform a project that will involve the use of the copyrighted works or other data or;
- b. termination or expiration of this agreement.

In addition, EPA may authorize another grantee to use copyrighted works or other data developed with Agency funds provided under this grant to perform another grant when such use promotes efficient and effective use of Federal grant funds.

4. DBE PART 31 - ACCEPTING GOALS - PROJECT GRANTS

UTILIZATION OF SMALL, MINORITY AND WOMEN'S BUSINESS ENTERPRISES

GENERAL COMPLIANCE, 40 CFR, Part 33

The recipient agrees to comply with the requirements of EPA's Program for Utilization of Small, Minority and Women's Business Enterprises in procurement under assistance agreements, contained in 40 CFR, Part 33.

FAIR SHARE OBJECTIVES, 40 CFR, Part 33, Subpart D

A recipient must negotiate with the appropriate EPA award official, or his/her designee, fair share objectives for MBE and WBE (MBE/WBE) participation in procurement under the financial assistance agreements.

Accepting the Fair Share Objectives/Goals of Another Recipient

The dollar amount of this assistance agreement is \$250,000, or more; or the total dollar amount of all of the recipient's non-TAG assistance agreements from EPA in the current fiscal year is \$250,000, or more. The recipient accepts the applicable MBE/WBE fair share objectives/goals negotiated with EPA by the Illinois Environmental Protection Agency as follows:

MBE: 5%

WBE: 12%

By signing this financial assistance agreement, the recipient is accepting the fair share objectives/goals stated above and attests to the fact that it is purchasing the same or similar construction, supplies, services and equipment, in the same or similar relevant geographic buying market as Illinois Environmental Protection Agency

Negotiating Fair Share Objectives/Goals, 40 CFR, Section 33.404

The recipient has the option to negotiate its own MBE/WBE fair share objectives/goals. If the recipient wishes to negotiate its own MBE/WBE fair share objectives/goals, the recipient agrees to submit proposed MBE/WBE objectives/goals based on an availability analysis, or disparity study, of qualified MBEs and WBEs in their relevant geographic buying market for construction, services, supplies and equipment.

The submission of proposed fair share goals with the supporting analysis or disparity study means that the recipient is **not** accepting the fair share objectives/goals of another recipient. The recipient agrees to submit proposed fair share objectives/goals, together with the supporting availability analysis or disparity study, to the Regional MBE/WBE Coordinator within 120 days of its acceptance of the financial assistance award. EPA will respond to the proposed fair share objective/goals within 30 days of receiving the submission. If proposed fair share objective/goals are not received within the 120 day time frame, the recipient may not expend its EPA funds for procurements until the proposed fair share objective/goals are submitted.

SIX GOOD FAITH EFFORTS, 40 CFR, Part 33, Subpart C

Pursuant to 40 CFR, Section 33.301, the recipient agrees to make the following good faith efforts whenever procuring construction, equipment, services and supplies under an EPA financial assistance agreement, and to ensure that sub-recipients, loan recipients, and prime contractors also comply. Records documenting compliance with the six good faith efforts shall be retained:

(a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

(b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

(c) Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

(d) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

(e) Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

(f) If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

MBE/WBE REPORTING, 40 CFR, Part 33, Sections 33.502 and 33.503

The recipient agrees to complete and submit EPA Form 5700-52A, "MBE/WBE Utilization Under Federal Grants, Cooperative Agreements and Interagency Agreements" beginning with the Federal fiscal year reporting period the recipient receives the award, and continuing until the project is completed. **Only procurements with certified MBE/WBEs are counted toward a recipient's MBE/WBE accomplishments.** The reports must be submitted **semiannually** for the periods ending March 31st and September 30th for:

Recipients of financial assistance agreements that capitalize revolving loan programs (CWSRF, DWSRF, Brownfields); and

All other recipients not identified as annual reporters (40 CFR Part 30 and 40 CFR Part 35, Subpart A and Subpart B recipients are annual reporters).

The reports are due within 30 days of the end of the semiannual reporting periods (April 30th and October 30th). Reports should be sent to

**Adrianne M. Callahan, Region 5 MBE/WBE Coordinator
USEPA, Acquisition and Assistance Branch
77 West Jackson Boulevard (MC-10J)
Chicago, IL 60604**

Final MBE/WBE reports must be submitted within 90 days after the project period of the grant ends. Your grant cannot be officially closed without all MBE/WBE reports.

EPA Form 5700-52A may be obtained from the EPA Office of Small Business Program's Home Page on the Internet at www.epa.gov/osbp.

CONTRACT ADMINISTRATION PROVISIONS, 40 CFR, Section 33.302

The recipient agrees to comply with the contract administration provisions of 40 CFR, Section 33.302.

BIDDERS LIST, 40 CFR, Section 33.501(b) and (c)

Recipients of a Continuing Environmental Program Grant or other annual reporting grant, agree to create and maintain a bidders list. Recipients of an EPA financial assistance agreement to capitalize a revolving loan fund also agree to require entities receiving identified loans to create and maintain a bidders list if the recipient of the loan is subject to, or chooses to follow, competitive bidding requirements. Please see 40 CFR, Section 33.501 (b) and (c) for specific requirements and exemptions.

5. DRUG-FREE WORKPLACE CERTIFICATION FOR ALL EPA RECIPIENTS

The recipient organization of this EPA assistance agreement must make an ongoing, good faith effort to maintain a drug-free workplace pursuant to the specific requirements set forth in Title 40 CFR 36.200 - 36.230. Additionally, in accordance with these regulations, the recipient organization must identify all known workplaces under its federal awards, and keep this information on file during the performance of the award.

Those recipients who are individuals must comply with the drug-free provisions set forth in Title 40 CFR 36.300.

The consequences for violating this condition are detailed under Title 40 CFR 36.510. Recipients can access the Code of Federal Regulations (CFR) Title 40 Part 36 at http://www.access.gpo.gov/nara/cfr/waisidx_06/40cfr36_06.html.

6. CENTRAL CONTRACTOR REGISTRATION AND UNIVERSAL IDENTIFIED REQUIREMENTS

A. Requirement for Central Contractor Registration (CCR). Unless you are exempted from this requirement under 2 CFR 25.110, you as the recipient must maintain the currency of your information in the CCR until you submit the final financial report required under this award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently if required by changes in your information or another award term.

B. Requirement for Data Universal Numbering System (DUNS) numbers. If you are authorized to make subawards under this award, you:

1. Must notify potential subrecipients that no entity (see definition in paragraph C of this award term) may receive a subaward from you unless the entity has provided its DUNS number to you.
2. May not make a subaward to an entity unless the entity has provided its DUNS number to you.

C. Definitions. For purposes of this award term:

1. Central Contractor Registration (CCR) means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the CCR Internet site (currently at <http://www.ccr.gov>).

2. Data Universal Numbering System (DUNS) number means the nine-digit number established and assigned by Dun and Bradstreet, Inc. (D&B) to uniquely identify business entities. A DUNS number may be obtained from D&B by telephone (currently 866-705-5711) or the Internet (currently at <http://fedgov.dnb.com/webform>).

3. Entity, as it is used in this award term, means all of the following, as defined at 2 CFR part 25, subpart C:

- a. A Governmental organization, which is a State, local government, or Indian tribe;
- b. A foreign public entity;
- c. A domestic or foreign nonprofit organization;
- d. A domestic or foreign for-profit organization; and
- e. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

4. Subaward:

a. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.

b. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. --.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").

c. A subaward may be provided through any legal agreement, including an agreement that you consider a contract.

5. Subrecipient means an entity that:

- a. Receives a subaward from you under this award; and
- b. Is accountable to you for the use of the Federal funds provided by the subaward.

7. HOTEL-MOTEL FIRE SAFETY

Pursuant to 40 CFR 30.18, if applicable, and 15 USC 2225a, the recipient agrees to ensure that all space for conferences, meetings, conventions, or training seminars funded in whole or in part with federal funds complies with the protection and control guidelines of the Hotel and Motel Fire Safety Act (PL 101-391, as amended). Recipients may search the Hotel-Motel National Master List at <http://www.usfa.dhs.gov/applications/hotel/> to see if a property is in compliance (FEMA ID is currently not required), or to find other information about the Act.

8. LOBBYING AND LITIGATION - ALL RECIPIENTS

The chief executive officer of this recipient agency shall ensure that no grant funds awarded under this assistance agreement are used to engage in lobbying of the Federal Government or in litigation against the United States unless authorized under existing law. The recipient shall abide by its respective OMB Circular (A-21, A-87, or A-122), which prohibits the use of federal grant funds for litigation against the United States or for lobbying or other political activities.

9. MANAGEMENT FEES

Management fees or similar charges in excess of the direct costs and approved indirect rates are not allowable. The term "management fees or similar charges" refers to expenses added to the direct costs in order to accumulate and reserve funds for ongoing business expenses, unforeseen liabilities, or for other similar costs which are not allowable under this assistance agreement. Management fees or similar charges may not be used to improve or expand the project funded under this agreement, except to the extent authorized as a direct cost of carrying out the scope of work.

10. RECYCLED PAPER - PART 31 RECIPIENTS - STATE, TRIBES & LOCAL GOVERNMENTS

In accordance with the policies set forth in EPA Order 1000.25 and Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management (January 24, 2007), the recipient agrees to use recycled paper and double sided printing for all reports which are prepared as a part of this agreement and delivered to EPA. This requirement does not apply to reports prepared on forms supplied by EPA, or to Standard Forms, which are printed on recycled paper and are available through the General Services Administration.

11. RECYCLED PRODUCTS - STATE AGENCIES AND POLITICAL SUBDIVISIONS

Any State agency or agency of a political subdivision of a State which is using appropriated Federal funds shall comply with the requirements set forth in Section 6002 of the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6962). Regulations issued under RCRA Section 6002 apply to any acquisition of an item where the purchase price exceeds \$10,000 or where the quantity of such items acquired in the course of the preceding fiscal year was \$10,000 or more. RCRA Section 6002 requires that preference be given in procurement programs to the purchase of specific products containing recycled materials identified in guidelines developed by EPA. These guidelines are listed in 40 CFR 247.

12. REIMBURSEMENT LIMITATION

EPA's financial obligations to the recipient are limited by the amount of federal funding awarded to date as shown on line 15 in its EPA approved budget. If the recipient incurs costs in anticipation of receiving additional funds from EPA, it does so at its own risk.

13. SINGLE AUDIT ANNUAL REPORTING REQUIREMENT

In accordance with OMB Circular A-133, which implements the Single Audit Act, the recipient hereby agrees to obtain a single audit from an independent auditor, if it expends \$500,000 or more in total Federal funds in any fiscal year. Within nine months after the end of a recipient's fiscal year or 30 days after receiving the report from the auditor, the recipient shall submit the SF-SAC and a Single Audit Report Package. **The recipient MUST** submit the SF-SAC and a Single Audit Report Package, using the Federal Audit Clearinghouse's Internet Data Entry System. For complete information on how to accomplish the single audit submissions, you will need to visit the Federal Audit Clearinghouse Web site: <http://harvester.census.gov/fac/>

14. SUBAWARD REPORTING

a. The recipient agrees to:

- (1) Establish all subaward agreements in writing;
- (2) Maintain primary responsibility for ensuring successful completion of the EPA-approved project (this responsibility cannot be delegated or transferred to a subrecipient);
- (3) Ensure that any subawards comply with the standards in Section 210(a)-(d) of OMB Circular A-133 and are not used to acquire commercial goods or services for the recipient;

- (4) Ensure that any subawards are awarded to eligible subrecipients and that proposed subaward costs are necessary, reasonable, and allocable;
 - (5) Ensure that any subawards to 501(c)(4) organizations do not involve lobbying activities;
 - (6) Monitor the performance of their recipients and ensure that they comply with all applicable regulations, statutes, and terms and conditions which flow down in the subaward;
 - (7) Obtain EPA's consent before making a subaward to a foreign or international organization, or a subaward to be performed in a foreign country; and
 - (8) Obtain approval from EPA for any new subaward work that is not outlined in the approved work plan in accordance with 40 CFR Parts 30.25 and 31.30, as applicable.
- b. Any questions about subrecipient eligibility or other issues pertaining to subawards should be addressed to the recipient's EPA Project Officer. Additional information regarding subawards may be found at <http://www.epa.gov/ogd/guide/subaward-policy-part-2.pdf>. Guidance for distinguishing between vendor and subrecipient relationships and ensuring compliance with Section 210(a)-(d) of OMB Circular A-133 can be found at <http://www.epa.gov/ogd/guide/subawards-appendix-b.pdf> and <http://www.whitehouse.gov/omb/circulars/a133/a133.html>.
- c. The recipient is responsible for selecting its subrecipients and, if applicable, for conducting subaward competitions.

15. SUBAWARDS AND EXECUTIVE COMPENSATION

a. Reporting of first-tier subawards.

1. Applicability. Unless you are exempt as provided in paragraph d. of this award term, you must report each action that obligates \$25,000 or more in Federal funds that does not include Recovery funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5) for a subaward to an entity (see definitions in paragraph e of this award term).

2. Where and when to report.

i. You must report each obligating action described in paragraph a.1. of this award term to www.fsrs.gov.

ii. For subaward information, report no later than the end of the month following the month in which the obligation was made.
(For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)

3. What to report. You must report the information about each obligating action that the submission instructions posted at www.fsrs.gov specify.

b. Reporting Total Compensation of Recipient Executives.

1. Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if --

i. the total Federal funding authorized to date under this award is \$25,000 or more;

ii. in the preceding fiscal year, you received—

(A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

iii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)

2. Where and when to report. You must report executive total compensation described in paragraph b.1. of this award term:

i. As part of your registration profile at www.ccr.gov.

ii. By the end of the month following the month in which this award is

made, and annually thereafter.

c. Reporting of Total Compensation of Subrecipient Executives.

1. Applicability and what to report. Unless you are exempt as provided in paragraph d. of this award term, for each first-tier subrecipient under this award, you shall report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if --

i. in the subrecipient's preceding fiscal year, the subrecipient received—
(A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and

ii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)

2. Where and when to report. You must report subrecipient executive total compensation described in paragraph c.1. of this award term:

i. To the recipient.
ii. By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (i.e., between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. Exemptions

If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report:

i. subawards,
and
ii. the total compensation of the five most highly compensated executives of any subrecipient.

e. Definitions. For purposes of this award term:

1. Entity means all of the following, as defined in 2 CFR part 25:
i. A Governmental organization, which is a State, local government, or Indian tribe;
ii. A foreign public entity;
iii. A domestic or foreign nonprofit organization;
iv. A domestic or foreign for-profit organization;
v. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

2. Executive means officers, managing partners, or any other employees in management positions.

3. Subaward:

i. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.
ii. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. --.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").

iii. A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.

4. Subrecipient means an entity that:

i. Receives a subaward from you (the recipient) under this award; and
ii. Is accountable to you for the use of the Federal funds provided by the

subaward.

5. Total compensation means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

i. *Salary and bonus* .

ii. *Awards of stock, stock options, and stock appreciation rights* . Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

iii. *Earnings for services under non-equity incentive plans* . This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.

iv. *Change in pension value*. This is the change in present value of defined benefit and actuarial pension plans.

v. *Above-market earnings on deferred compensation which is not tax-qualified* .

vi. Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.

16. SUSPENSION & DEBARMENT: 2 CFR PART 1532

Recipient shall fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled "Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons)." Recipient is responsible for ensuring that any lower tier covered transaction as described in Subpart B of 2 CFR Part 180 and 2 CFR Part 1532, entitled "Covered Transactions," includes a term or condition requiring compliance with Subpart C. Recipient is responsible for further requiring the inclusion of a similar term or condition in any subsequent lower tier covered transactions. Recipient acknowledges that failing to disclose the information as required at 2 CFR 180.335 may result in the delay or negation of this assistance agreement, or pursuance of legal remedies, including suspension and debarment.

Recipient may access the Excluded Parties List System at www.epls.gov. This term and condition supersedes EPA Form 5700-49, "Certification Regarding Debarment, Suspension, and Other Responsibility Matters."

17. TRAFFICKING IN PERSONS

a. *Provisions applicable to a recipient that is a private entity* .

1. You as the recipient, your employees, subrecipients under this award, and subrecipients' employees may not—

i. Engage in severe forms of trafficking in persons during the period of time that the award is in effect;

ii. Procure a commercial sex act during the period of time that the award is in effect; or

iii. Use forced labor in the performance of the award or subawards under the award.

2. We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a subrecipient that is a private entity —

i. Is determined to have violated a prohibition in paragraph a.1 of this award term; or

ii. Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either—

A. Associated with performance under this award; or

B. Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, "OMB Guidelines to Agencies on

Governmentwide Debarment and Suspension (Nonprocurement)," as implemented by our Agency at 2 CFR 1532.

b. *Provision applicable to a recipient other than a private entity* . We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a subrecipient that is a private entity—

1. Is determined to have violated an applicable prohibition in paragraph a.1 of this award term; or

2. Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph a.1 of this award term through conduct that is

either—

- i. Associated with performance under this award; or
- ii. Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, "OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," as implemented by our agency at 2 CFR 1532

c. *Provisions applicable to any recipient .*

- 1. You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.
- 2. Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:
 - i. Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)), and
 - ii. Is in addition to all other remedies for noncompliance that are available to us under this award.
- 3. You must include the requirements of paragraph a.1 of this award term in any subaward you make to a private entity.

d. *Definitions .* For purposes of this award term:

- 1. "Employee" means either:
 - i. An individual employed by you or a subrecipient who is engaged in the performance of the project or program under this award; or
 - ii. Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.
- 2. "Forced labor" means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.
- 3. "Private entity":
 - i. Means any entity other than a State, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.
 - ii. Includes:
 - A. A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).
 - B. A for-profit organization.
- 4. "Severe forms of trafficking in persons," "commercial sex act," and "coercion" have the meanings given at section 103 of the TVPA, as amended (22 U.S.C. 7102).

18. UNLIQUIDATED OBLIGATIONS - INTERIM FFR - PART 31 RECIPIENTS

Submission of interim Federal Financial Reports

Pursuant to 40 CFR 31.41(b) and 31.50(b), EPA recipients shall submit an annual Federal Financial Report (SF-425) to EPA no later than 90 calendar days following the end of the reporting quarter.

The following reporting period end dates shall be used for interim reports: 5/31

At the end of the project, the recipient must submit a final Federal Financial Report to EPA no later than 90 calendar days after the end of the project period. The form is available on the internet at <http://www.epa.gov/ocfo/financeservices/forms.htm> . All FFRs must be submitted to the Las Vegas Finance Center: US EPA, LVFC, PO Box 98515, Las Vegas, NV 89193, or by Fax to: 702-798-2423.

The LVFC will make adjustments, as necessary, to obligated funds after reviewing and accepting a final Federal Financial Report. Recipients will be notified and instructed by EPA if they must complete any additional forms for the closeout of the assistance agreement.

EPA may take enforcement actions in accordance with 40 CFR 31.43 if the recipient does not comply with this term and condition.

Programmatic Conditions

1. ENVIRONMENTAL RESULTS - RECIPIENT PERFORMANCE REPORTING

Recipients subject to 40 C.F.R. Part 31 (other than recipients of State or Tribal Program grants under 40 C.F.R. Parts 35 Subparts A or B)

Performance Reports:

In accordance with 40 C.F.R. §31.40, the recipient agrees to submit performance reports that include brief information on each of the following areas: 1) a comparison of actual accomplishments to the outputs/outcomes established in the assistance agreement workplan for the period; 2) the reasons for slippage if established outputs/outcomes were not met; and 3) additional pertinent information, including, when appropriate, analysis and information of cost overruns or high unit costs.

In accordance with 40 C.F.R. § 31.40 (d), the recipient agrees to inform EPA as soon as problems, delays or adverse conditions become known which will materially impair the ability to meet the outputs/outcomes specified in the assistance agreement work plan.

2. Substantial Federal Involvement for Cooperative Agreements

EPA will provide substantial involvement in the form of technical assistance, development of outputs, and oversight. Specifically, substantial federal involvement will take the form of monitoring the project by EPA; participation and collaboration between EPA and the recipient in program content; review of project progress, and quantification and reporting of results.

3. Reimbursement Term and Condition for Lindsay Light Cooperative Agreement – Chicago Park District

a. Definitions. Any capitalized terms not defined in this Cooperative Agreement shall have the meaning ascribed to them in the Consent Decree and Environmental Settlement Agreement ("Settlement Agreement") filed in In re Tronox Incorporated, U.S. Bankruptcy Court (SDNY) Case No. 09-10156 (ALG).

b. Agreement to Disburse Special Account Funds. Subject to the terms and conditions set forth in this Cooperative Agreement, EPA agrees to make the DuSable Park payment received pursuant to Paragraph 117 subsection g. of the Consent Decree, including Interest Earned thereon (For purposes of this Paragraph, "Interest Earned" shall mean interest earned on the DuSable Park Distribution from the date it is received by EPA. "Interest Earned" shall be computed monthly at a rate based on the annual return on investments of the Hazardous Substance Superfund. The applicable rate of interest shall be the rate in effect at the time the interest accrues), available for disbursement to the Chicago Park District from the DuSable Park Special Account as partial reimbursement for the performance of work performed in accordance with the EPA approved workplan(s) for this Cooperative Agreement (the "Work").

c. Timing of Disbursement of Special Account Funds. Within ninety (90) days of EPA's receipt of a Cost Summary and Certification, as defined by Paragraph d below, or if EPA has requested additional information under Paragraph d or a revised Cost Summary and Certification under Paragraph e below, within sixty (60) days of receipt of the additional information or revised Cost Summary and Certification, EPA shall disburse funds from the DuSable Park Special Account subject to the conditions set forth in this term and condition.

d. Requests for Disbursement of Special Account Funds. The Chicago Park District may periodically, but no more often than monthly, submit to EPA a Cost Summary and Certification, which shall include: (a) a written summary of costs incurred and paid by the Chicago Park District for Work performed under this Cooperative Agreement over a specified period of time; and (b) the following statement signed by the Chicago Park District's comptroller:

"To the best of my knowledge, and after thorough investigation and review of the supporting documentation provided to me by the Chicago Park District, I certify that the information contained in or accompanying this submittal is true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment."

The person signing the above statement shall provide EPA with a list of the documents that he or she reviewed in support of the Cost Summary and Certification, and the Chicago Park District shall submit to EPA any additional information requested by EPA for its review and approval of a Cost Summary and Certification.

e. Recalculation of Costs. If EPA determines that a Cost Summary and Certification includes a mathematical accounting error, costs excluded under Paragraph f below, costs that are inadequately documented, or costs submitted in a prior Cost Summary and Certification, EPA will notify the Chicago Park District specifying the EPA's exceptions to the submittal and allow it to submit a revised Cost Summary and Certification. If the Chicago Park District fails to submit a revised Cost Summary and Certification within thirty (30) days of being given notice of the opportunity to do so, EPA will recalculate the amount eligible for disbursement for that submission and disburse the corrected amount in accordance with Paragraph c above.

f. Costs Excluded from Disbursement. Disbursements shall not be made from the DuSable Park Special Account for the following: (a) payments by the Chicago Park District to the United States in connection with the DuSable Park, including but not limited to any interest paid pursuant to Paragraph h below; (b) attorneys' fees and costs, except for reasonable attorneys' fees and costs related to site access and/or placement of institutional controls which are necessary for performance of the Work under this Cooperative Agreement; (c) costs of any response activities that are not approved by EPA pursuant to this Cooperative Agreement(s); (d) costs related to the litigation, settlement, or development of potential contribution claims by the Chicago Park District; (e) internal costs of the Chicago Park District for this Cooperative Agreement, including, but not limited to, salaries, travel, or in-kind services, except for costs that represent the work of employees directly performing Work under this Cooperative Agreement; (f) costs incurred by the Chicago Park District under this Cooperative Agreement prior to the Effective Date of the Settlement Agreement; and (g) costs incurred by the Chicago Park District in connection with dispute resolution under the Cooperative Agreement or Settlement Agreement.

g. Termination of Special Account Disbursements. EPA's obligation to disburse funds from the DuSable Park Special Account pursuant to the Consent Decree and this Cooperative Agreement shall terminate upon EPA's determination that the Chicago Park District: (a) has knowingly submitted a materially false or misleading Cost Summary and Certification; and/or (b) has submitted a materially inaccurate or incomplete Cost Summary and Certification, and has failed to correct that Cost Summary and Certification within thirty (30) days after being given written notice of the opportunity to do so. EPA's obligation to disburse funds from the DuSable Park Special Account shall also terminate upon EPA's assumption of performance of any Work required under the Cooperative Agreement, when such assumption is not challenged by the Chicago Park District, or, if challenged, is upheld in EPA's favor pursuant to any applicable dispute resolution provisions for this Cooperative Agreement.

h. Recapture of Special Account Disbursements. Upon the termination of disbursements pursuant to Paragraph g above, if EPA has previously disbursed funds from the DuSable Park Special Account for activities that are specifically related to the reason for termination (e.g., if a materially false or misleading submission is discovered after the disbursement of funds based on that submission), EPA shall submit a bill to the Chicago Park District for any disbursed amount which is specifically related to the reason for termination, plus Interest (For purposes of this Paragraph, "Interest," shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.) on that amount covering the period from the date of disbursement of the funds by EPA to the date of repayment of the funds by the Chicago Park District. Within thirty (30) days of receipt of EPA's bill, the Chicago Park District shall pay the billed amount by a certified or cashier's check(s). The check(s) shall be made payable to "EPA Hazardous Substance Superfund" and shall reference the name and address of the party making payment, EPA Site/Spill Identification Number 05YT and Department of Justice Case Number 90-11-3-09688. The payment shall be sent to:

United States Environmental Protection Agency, Region 5
Attention: Program Accounting and Analysis Section; Comptroller Branch
P.O. Box 70753
Chicago, Illinois 60673

Upon receipt of payment, EPA may deposit all or any portion thereof in the DuSable Park Special Account of the Hazardous Substance Superfund. EPA's determination of where to deposit or how to use

the funds shall not be subject to challenge by the Chicago Park District.

i. Balance of Special Account Funds. After EPA issues its written Certification of Completion of the removal action pursuant to the work plan(s) of this Cooperative Agreement, and after EPA completes all disbursements to the Chicago Park District in accordance with this Cooperative Agreement, if any funds remain in the DuSable Park Special Account, EPA may transfer such funds first to the Lindsay Light II Special Account and then to the Hazardous Substance Superfund. Any such transfer of funds shall not be subject to challenge by the Chicago Park District.

j. The Chicago Park District shall submit documentation required by the Reimbursement term and condition of this cooperative agreement to the Project Officer (Isalee Coleman) and the Technical Contacts (Verneta Simon and Eugene Jablonowski) electronically prior to requesting payments for such costs from ASAP. The Chicago Park District may request payment for costs it has incurred under this cooperative agreement only after EPA has approved those costs under the Reimbursement term and condition of this cooperative agreement.

k. Dispute Resolution. Disputes under this Cooperative Agreement are subject to 40 C.F.R. Part 31, Subpart F.

4. FOOD & REFRESHMENTS

Unless the event(s) are specified in the approved workplan, the recipient agrees to obtain prior approval from EPA for the use of grant funds for light refreshments and/or meals served at meetings, conferences, training workshops, and outreach activities (events). The recipient must send requests for approval to the EPA Project Officer and include:

- (1) An estimated budget and description for the light refreshments, meals, and/or beverages to be served at the event(s);
- (2) A description of the purpose, agenda, location, length and timing for the event.
- (3) An estimated number of participants in the event and a description of their roles.

Recipients may address questions about whether costs for light refreshments, and meals for events are allowable to the recipient's EPA Project Officer. However, the Agency Award Official or Grant Management Officer will make final determinations on allowability.

Note: U.S. General Services Administration regulations define light refreshments for morning, afternoon or evening breaks to include, but not be limited to, coffee, tea, milk, juice, soft drinks, donuts, bagels, fruit, pretzels, cookies, chips, or muffins. (41 CFR 301-74.11)

5. QUARTERLY REPORTING

Quarterly technical performance reports must be submitted within 30 days following the end of each three month period. A final technical performance report must be submitted 90 days after the end of the budget and project periods. All technical performance reports must be submitted to the EPA Project Officer as identified on page one of this Assistance Agreement.

6. SUFFICIENT PROGRESS

EPA may terminate the assistance agreement for failure of the recipient to make sufficient progress so as to reasonably ensure completion of the project within the project period, including any extensions. EPA will measure sufficient progress by examining the performance required under the workplan in conjunction with the milestone schedule, the time remaining for performance within the project period, and/or the availability of funds necessary to complete the project.

7. QUALITY ASSURANCE

A Quality Assurance Project Plan (QAPP), complete with data quality objectives, must be submitted within 90 days of the date of this agreement. Costs associated with the environmental measurement or data collection for monitoring are not allowable costs until the QMP/QAPP is submitted, nor will costs be reimbursed until the QMP/QAPP is approved.

Kornder, Steve

From: EUGENE JABLONOWSKI [Jablonowski.Eugene@epamail.epa.gov]
Sent: Friday, June 01, 2012 3:20 PM
To: Kornder, Steve
Cc: Cooper, Daniel; VERNETA SIMON; Mary Fulghum; Cathleen Martwick; Padmavati Bending
Subject: RE: DuSable Park - Start of Field Work

Dan and Steve,

U.S. EPA acknowledges your email and your planned start date of Monday June 4, 2012. Please keep Verneta and I informed of your progress (daily as possible) and of any notable findings as they occur.

Thanks,

Gene

Sent with Good (www.good.com)

----- Original Message -----

From : "Kornder, Steve" <Steve.Kornder@aecom.com>
To : EUGENE JABLONOWSKI/R5/USEPA/US@EPA, VERNETA SIMON/R5/USEPA/US@EPA
Cc : "Cooper, Daniel" <dan.cooper@chicagoparkdistrict.com>
Sent on : 06/01/2012 04:08:00 PM
Subject : DuSable Park - Start of Field Work

Good Afternoon:

I am forwarding this email to confirm our planned start date of Monday June 4, 2012. As I discussed with Verneta late week, and Gene early this week (on Wednesday May 30th), we have modified the work plan according to the comments provided from the USEPA (see responses in May 30th email) and are preparing a standalone QAPP document. AECOM will be forwarding this document to the USEPA as soon as you have had a chance to review the responses.

I would appreciate your acknowledgement of this email. Thank you for assistance and please contact us if you have any questions.

Sincerely,

Steve Kornder, Ph.D.

Senior Project Geochemist

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Appendix B

Historical Radiological Soil Investigation Reports – June 2002 & October 2007

June 12, 2002

COPY

Mr. Bernard Bono
Senior Engineer
Kerr-McGee Chemical LLC
800 Weyrauch Street
West Chicago, Illinois 60185

Re: DuSable Park Limited Site Investigation
Chicago, Illinois
ProSource Project No. 386-00

Dear Mr. Bono:

ProSource Technologies, Inc. (ProSource) is pleased to submit this letter report to Kerr-McGee Chemical LLC (KM) which presents the results of the recently completed Limited Site Investigation at the DuSable Park Site (Site) in Chicago, Illinois (Figure 1). All field work was completed in accordance with the *Investigation Work Plan, DuSable Park Site* (Work Plan) dated November 12, 2001 and last revised March 21, 2002. All work was also supervised by United States Environmental Protection Agency (USEPA) staff. The following sections present a summary of the field work activities, a presentation of the data, and a discussion of the results.

Summary of Field Work Activities

As outlined in the Work Plan, the work included a limited investigation of four previously identified areas of concern (Figure 2). Generally, the work included a surface gamma survey, downhole gamma logging, soil sampling, sample preparation, surveys for unrestricted release of equipment, and decontamination. Initially, surface gamma surveys were conducted of each area of concern. The surface gamma surveys were completed using a Ludlum® Model 2221 equipped with a Ludlum® Model 44-10 probe which were coupled to a Trimble® Model Pro-XR global positioning system (GPS) unit and a hand-held datalogger. The datalogger recorded the physical locations and gamma readings during the surface gamma survey. Where feasible, the surface gamma surveys extended at least 10 meters laterally of any elevated gamma readings.

Upon completion of the surface gamma survey, the data was processed to determine the areas with the highest gamma readings. At the point of the highest surface gamma reading in each area, the GPS unit was used to navigate back to five small areas of elevated gamma readings (Figures 3 through 6). A test hole was then advanced vertically by driving a steel casing to a depth of two feet via hand or mechanical methods. The borehole was then gamma logged with a calibrated meter to determine if radioactive material was present in concentrations exceeding 7.1 picocuries per gram (pCi/g). In each case, material exceeding the criteria was encountered within the upper two feet resulting in the test hole being advanced to a deeper depth and four additional test holes (or step outs) being advanced surrounding the initial test hole.

Upon completion of the gamma logging, shallow soil samples were collected using a stainless steel hand auger from the depth corresponding to the highest downhole gamma reading. In each case, a soil sample was collected from three to nine inches below grade which corresponded to the six inch depth interval of the test hole. The sample was thoroughly composited in the field and rocks, sticks and foreign objects greater than approximately one-inch were removed. Approximately four pounds of the field sample was placed into sturdy water tight bags

for transport to the KM laboratory located in West Chicago, Illinois. Once the field sample was collected, the remaining soil was given to USEPA field staff who in turn conducted additional screening and compositing in the field.

Soils encountered at each sampling location were typically classified as very dark brown to black, silty fine to medium grained sand with gravel. Fragments of coal, slag, brick and concrete were typically present at all locations.

Upon completion of all field sampling activities, all drilling locations and pertinent land features were surveyed utilizing a Trimble® Model TTS 500 Total Station. Copies of the surface gamma survey data are included in Attachment A. Copies of the Borehole Field Logs, field notes and meter calibration data are included in Attachment B. The KM laboratory report is included in Attachment C.

Data Summary

Surface Gamma Survey

As previously stated, the initial task was to complete a surface gamma survey. Figures 3 through 6 present the results of the surface gamma surveys. During the survey, over 2,946 data points were obtained with only 67 data points exhibiting gamma readings above the 7.1 pCi/g criteria. The 67 points were determined to be very localized and confined to five small areas. Table 1 presents the location and highest gamma readings for each area of concern. As shown in Table 1, the highest gamma readings ranged from a low of 7.9 pCi/g at surface gamma survey data point 512 to a high of 17.7 pCi/g at surface gamma survey data point 2756.

Downhole Gamma Logging

Initially, one test hole was advanced at surface gamma survey data points 512, 832, 1951 and 2756. Table 2 presents the results of the gamma logging for each test hole and Figure 6 depicts each test hole location. Each test hole was advanced to a minimum depth of 24 inches with some extending to deeper depths. Downhole gamma readings above the 7.1 pCi/g criteria equivalent of 1,849 counts per minute (cpm) from each of the initial four test holes ranged from a low of 7.9 pCi/g at test hole 512 to a high of 13.3 pCi/g at test hole 832. In each case, the highest gamma reading was obtained from the six inch depth interval of each test hole resulting in the advancement of four "step out" test holes. It should be noted that no gamma readings were obtained above the 7.1 pCi/g criteria equivalent of 1,849 cpm in any of the other "step out" test holes including surface gamma survey point 1826 which was utilized as a southern step out for test hole 1951.

Laboratory Results

Analysis of the four collected soil samples was performed by the KM laboratory in West Chicago, Illinois. Samples were prepared and gamma ray spectral analysis was performed using Canberra® HPGe detector system. The KM laboratory report is included in Attachment C. Samples were quantified for total radium as follows:

Total Radium (Ra) = Lead (Pb) 214 + Actinium (Ac) 228

Pb 214 is in the Uranium (U) 238 chain and is a measurement of Ra 226

Ac 228 is in the Thorium (Th) 232 chain and is a measurement of Ra 228

Therefore,

Total Radium = Ra 226 + Ra 228

Table 3 presents a summary of the KM laboratory results. Total Radium was identified above the 7.1 pCi/g criteria in samples collected from test holes 512 (11.7 pCi/g), 832 (9.5 pCi/g) and 1951 (15.0 pCi/g). Total Radium identified at test hole 2756 was 0.58 pCi/g which is well below the 7.1 pCi/g criteria.

Discussion of Results

Surface Gamma Survey

As presented above, surface gamma readings identified above the 7.1 pCi/g criteria were identified at five localized areas of the Site. Average surface gamma readings were observed below the 7.1 pCi/g criteria for 100 square meters surrounding each of the four highest target areas (Table 1) as follows (Attachment D):

3.7 pCi/g	Gamma point 512 (202 points)
3.7 pCi/g	Gamma point 832 (255 points)
4.2 pCi/g	Gamma point 1951 (386 points)
3.9 pCi/g	Gamma point 2756 (249 points)

In all cases, the identified surface gamma readings above the 7.1 pCi/g criteria were determined to be very localized and generally confined to areas less than one meter in diameter.

Downhole Gamma Logging

Gamma readings identified above the 7.1 pCi/g criteria were typically identified at the six inch depth interval at each of the four initial test holes. Thickness of readings above 7.1 pCi/g were six inches at test holes 832 and 2756, 12 inches at test hole 512, and 24 inches at test hole 1951. A minimum of two gamma readings below 7.1 pCi/g were obtained from the bottom of each test hole.

Average gamma readings for the six inch depth interval at each initial test hole and corresponding "step out" test holes were observed well below the 7.1 pCi/g criteria at all locations. Specifically, the average gamma readings at the six inch depth interval for each test hole group were 4.5 pCi/g at 512, 4.4 pCi/g at 832, 4.9 pCi/g at 1951 and 3.5 pCi/g at 2756.

In all cases, the identified downhole gamma measurements were identified less than 24 inches in depth and not identified in any "step out" test holes which further supports the findings that the gamma readings are not laterally extensive.

Laboratory Data

Four samples were analyzed by the KM laboratory using gamma ray spectral analysis. Total Radium was identified slightly above the 7.1 pCi/g criteria in three of the samples collected from test holes ranging in gamma activity from 9.2 pCi/g to 15.0 pCi/g. Generally, the soil sample results are comparable to the downhole gamma readings in that the gamma readings are slightly elevated above the 7.1 pCi/g criteria.

However, total Radium identified at test hole 2756 was 0.6 pCi/g which is well below the 7.1 pCi/g criteria. This result does not compare favorably with the downhole gamma measurement of 2,667 cpm or 10.2 pCi/g. The


source of the elevated downhole gamma measurement is likely a piece of oversized material such as a brick, slag or coal fragment. Oversized material (>1 inch diameter) were segregated from the soil matrix during soil sampling in accordance with the DuSable Park Soil Sampling Work Instruction included in the Work Plan.

Closing

I sincerely appreciate the opportunity to conduct the Limited Site Investigation at DuSable Park. If you have any questions, please do not hesitate to contact me at (763) 786-1445.

Very truly yours,

ProSource Technologies, Inc.



Wade A. Carlson
Senior Geologist/Project Manager

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TABLES

Table 1 - Summary of Highest Surface Gamma Survey Points

Table 2 - Downhole Gamma Results

Table 3 - Summary of Laboratory Results

TABLE 1
Summary of Highest Surface Gamma Survey Points
DuSable Park
Chicago, Illinois
ProSource Project No. 00-386

Surface Gamma Survey ID Number	Easting	Northing	GPS Date	GPS Time	Gamma (cpm)	Gamma (pCi/g)	Survey Type
512	1180378.80	1903282.07	5/3/02	10:36:37AM	8,062	8.92	Pro XR
832	1180334.37	1902987.89	5/3/02	10:55:56AM	8,910	9.85	Pro XR
1826	1180233.58	1903113.83	5/3/02	11:33:26AM	7,142	7.90	Pro XR
1951	1180218.27	1903130.36	5/3/02	11:39:52AM	15,339	16.96	Pro XR
2756	1180251.41	1903157.24	5/3/02	12:09:27PM	16,044	17.74	Pro XR

Notes:

1. cpm = counts per minute
pCi/g = picocuries per gram
GPS = Global Positioning System
ProXR = Trimble Model ProXR GPS
2. Coordinates based on State Plane - Illinois East 1983

TABLE 2
Downhole Gamma Results
 Limited Site Investigation
 DuSable Park
 Chicago, Illinois
 ProSource Project No. 386-00

Test Hole>> Depth (inches)	512 Center		512 N 5		512 E 5		512 S 5		512 W 5	
	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	1,534	6.0	360	1.4	364	1.4	304	1.2	262	1.0
6"	3,073	12.0	965	3.8	655	2.6	568	2.2	483	1.9
12"	2,035	7.9	1,581	6.2	640	2.5	601	2.3	717	2.8
18"	1,171	4.6	1,347	5.3	306	1.2	921	3.6	745	2.9
24"	701	2.7	517	2.0	350	1.4	852	3.3	851	3.3
30"					353	1.4	675	2.6	1,008	3.9
36"					401	1.6			994	3.9
42"					464	1.8			709	2.8
48"					683	2.7				
54"					721	2.8				
60"					Refusal					

Test Hole>> Depth (inches)	832 Center		832 S 5		832 E 5		832 N 5		832 N 5	
	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	1,276	5.0	260	1.0	349	1.4	254	1.0	209	0.8
6"	3,416	13.3	453	1.8	998	3.9	399	1.6	405	1.6
12"	1,598	6.2	465	1.8	1,435	5.6	349	1.4	820	3.2
18"	593	2.3	518	2.0	440	1.7	591	2.3	757	3.0
24"	474	1.8	471	1.8	387	1.5	402	1.6	611	2.4
30"			453	1.8			254	1.0		
36"										
42"										
48"										
54"										
60"										

Test Hole>> Depth (inches)	1951 Center		1826		1951 N 5		1951 W 5		1951 E 5	
	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	2,738	10.7	701	2.7	625	2.4	314	1.2	291	1.1
6"	3,094	12.1	1,160	4.5	997	3.9	544	2.1	462	1.8
12"	2,722	10.6	700	2.7	1,054	4.1	772	3.0	564	2.2
18"	2,296	9.0	635	2.5	858	3.3	743	2.9	623	2.4
24"	1,510	5.9	632	2.5	686	2.7	771	3.0	621	2.4
30"	1,129	4.4					768	3.0	594	2.3
36"							848	3.3		
42"							828	3.2		
48"							814	3.2		
54"										
60"										

Test Hole>> Depth (inches)	2756 Center		2756 E 5		2756 W 5		2756 S 5		2756 N 10	
	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g	cpm	pCi/g
0"	1,125	4.4	262	1.0	350	1.4	286	1.1	277	1.1
6"	2,667	10.4	342	1.3	545	2.1	470	1.8	443	1.7
12"	879	3.4	488	1.9	597	2.3	522	2.0	451	1.8
18"	518	2.0	490	1.9	467	1.8	508	2.0	397	1.5
24"	529	2.1	558	2.2	434	1.7	497	1.9	389	1.5
30"	426	1.7	528	2.1						
36"	390	1.5	503	2.0						
42"										
48"										
54"										
60"										

Notes:

1. Bold, italics denotes above 7.1 pCi/g or 1,849 cpm criteria.

2. cpm = counts per minute, pCi/g = picocuries per gram

TABLE 3
Summary of Laboratory Results
DuSable Park
Chicago, Illinois
ProSource Project No. 00-386

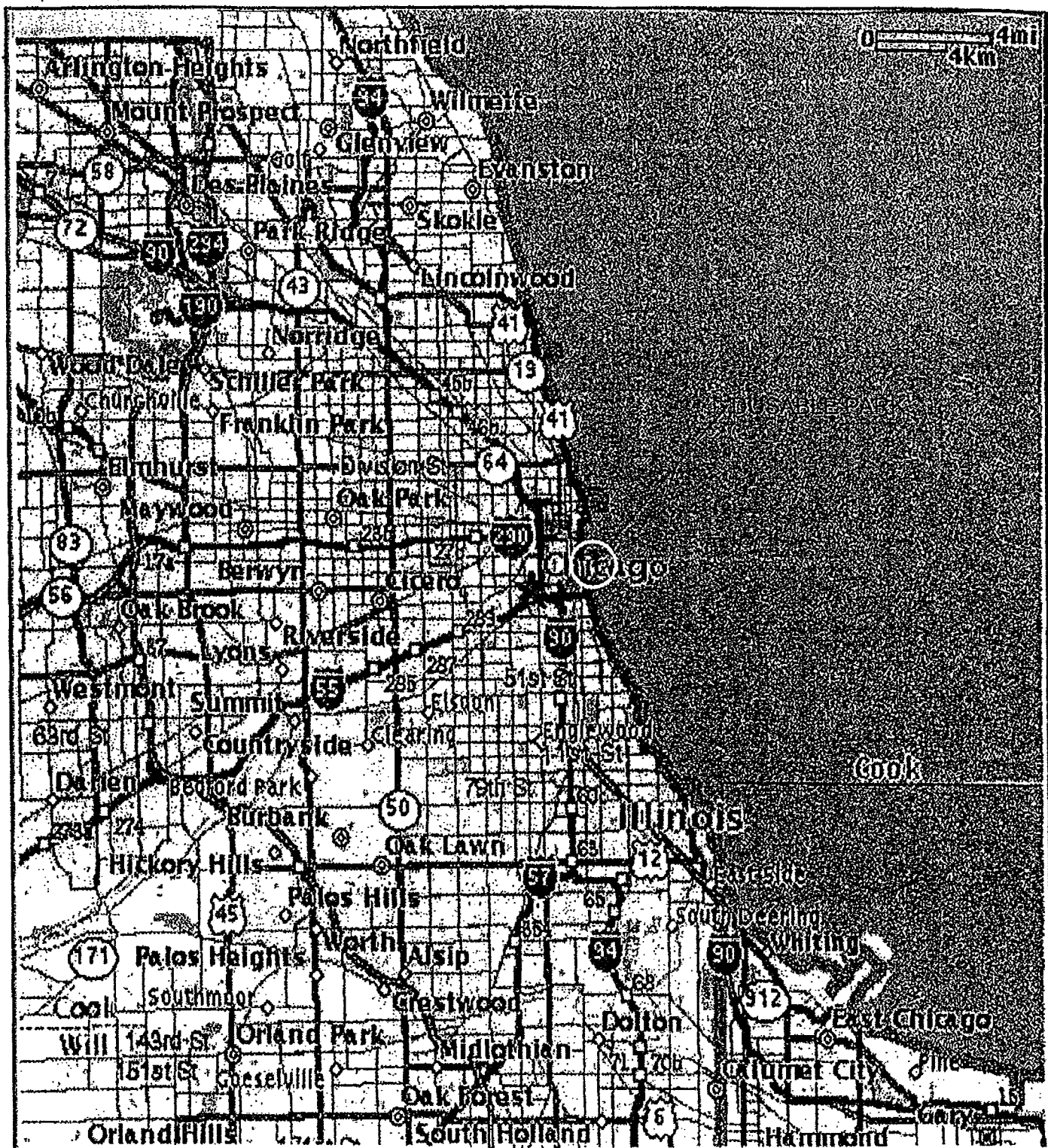
Sample #	Ra 226	Ra 228	Total Radium
512	1.985	9.718	11.7
832	1.814	7.643	9.5
1951	0.7814	14.18	15.0
2756	0.1368	0.4431	0.6

Notes:

All data presented in picocuries per gram (pCi/g).

FIGURES

- Figure 1 - Site Location Map
- Figure 2 - Areas of Concern
- Figure 3 - Area A Surface Gamma Survey
- Figure 4 - Area B1 and B2 Surface Gamma Survey
- Figure 5 - Area C Surface Gamma Survey
- Figure 6 - Test Hole Location Map



SITE LOCATION



FIGURE 1
SITE LOCATION MAP
DUSABLE PARK, CHICAGO, ILLINOIS

Dr. Seitz
TECHNOLOGIES, Inc.

OGDEN SLIP

LAKE SHORE DRIVE OVERPASS

Sheet Pile Wall

AREA A

Light Pole

Storm Sewer

Parking Lot

Guard Rail






AREA B1

AREA B2

AREA C

Fence

CHICAGO RIVER

-  Area of Concern
-  Sheet pile wall
-  Parking lot
-  Guard rail
-  Fence

60 0 60 Feet

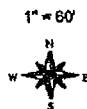
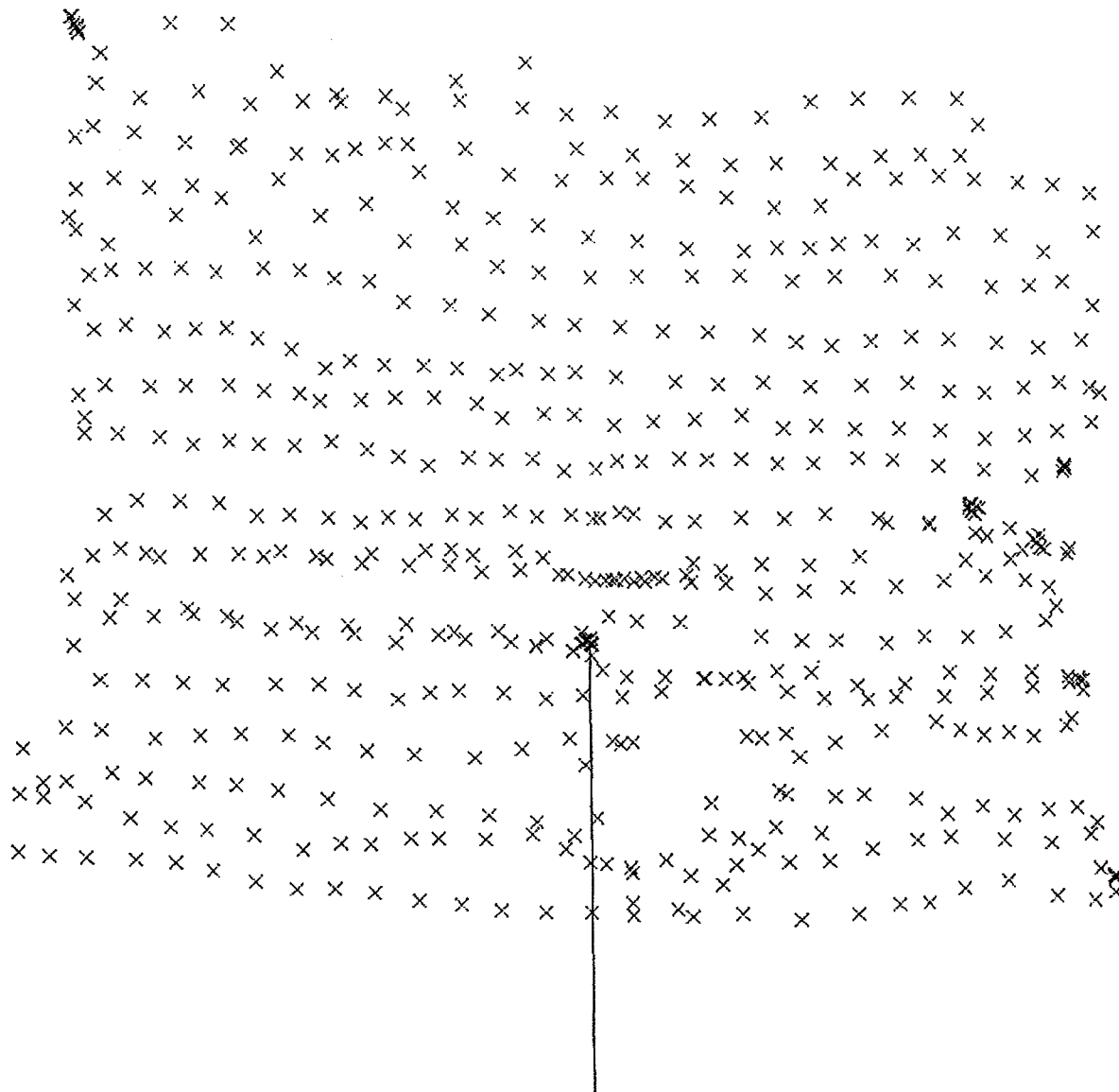


FIGURE 2
DUSABLE PARK
AREAS OF CONCERN

Source
TECHNOLOGIES, Inc.



DATA POINT 512

10 0 10 Feet

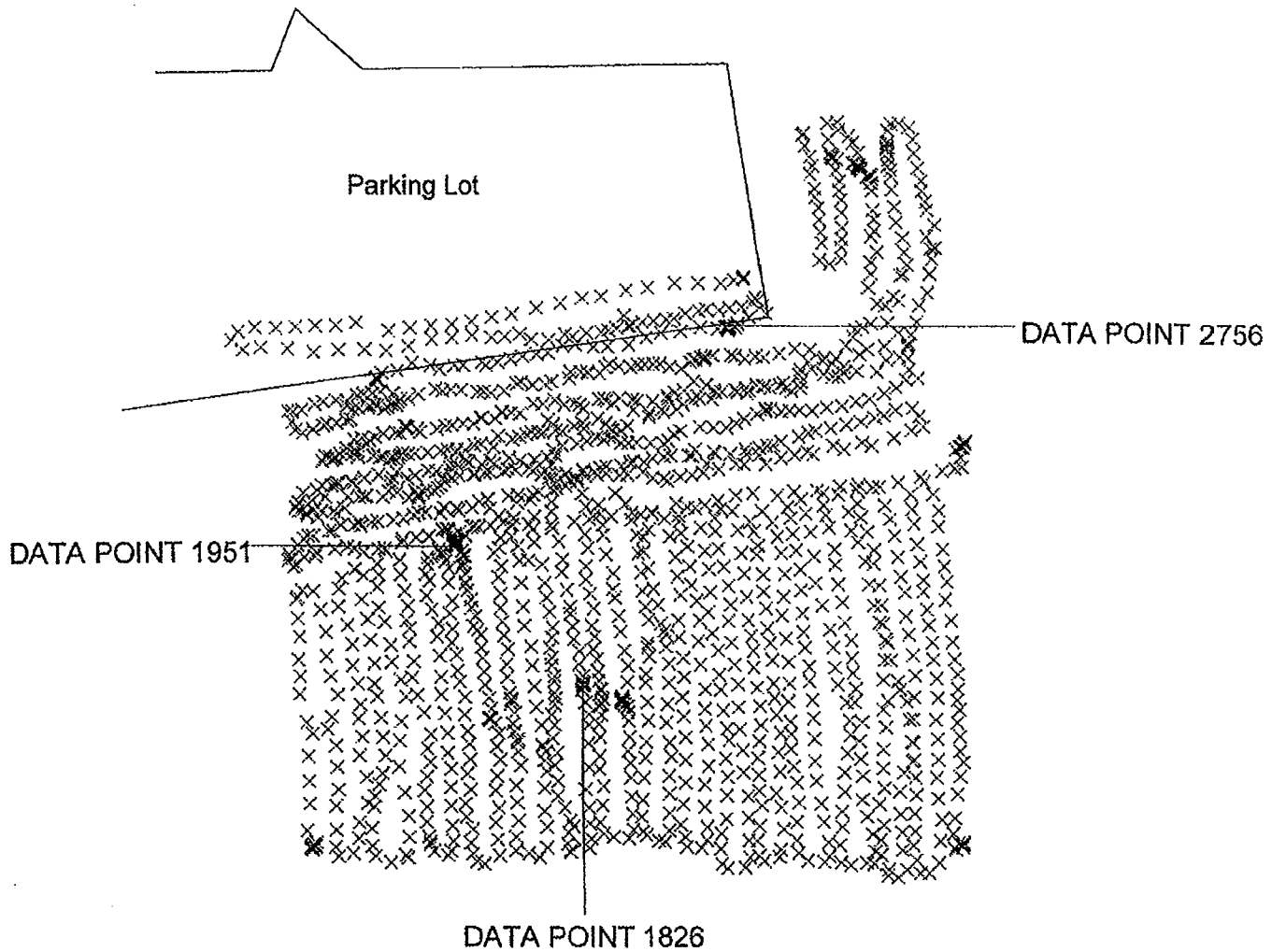
Parking lot
 DuSable Park Surface Gamma Survey 5/3/02
 x 0 - 7.09
 x >7.100 - 9999

1" = 10'



FIGURE 3
AREA A
SURFACE GAMMA SURVEY

DR. S. M. R. C.
TECHNOLOGIES, INC.



20 0 20 Feet

\ Parking lot
 DuSable Park Surface Gamma Survey 5/3/02
 X 0 - 7.09
 X >7.100 - 8999

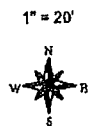
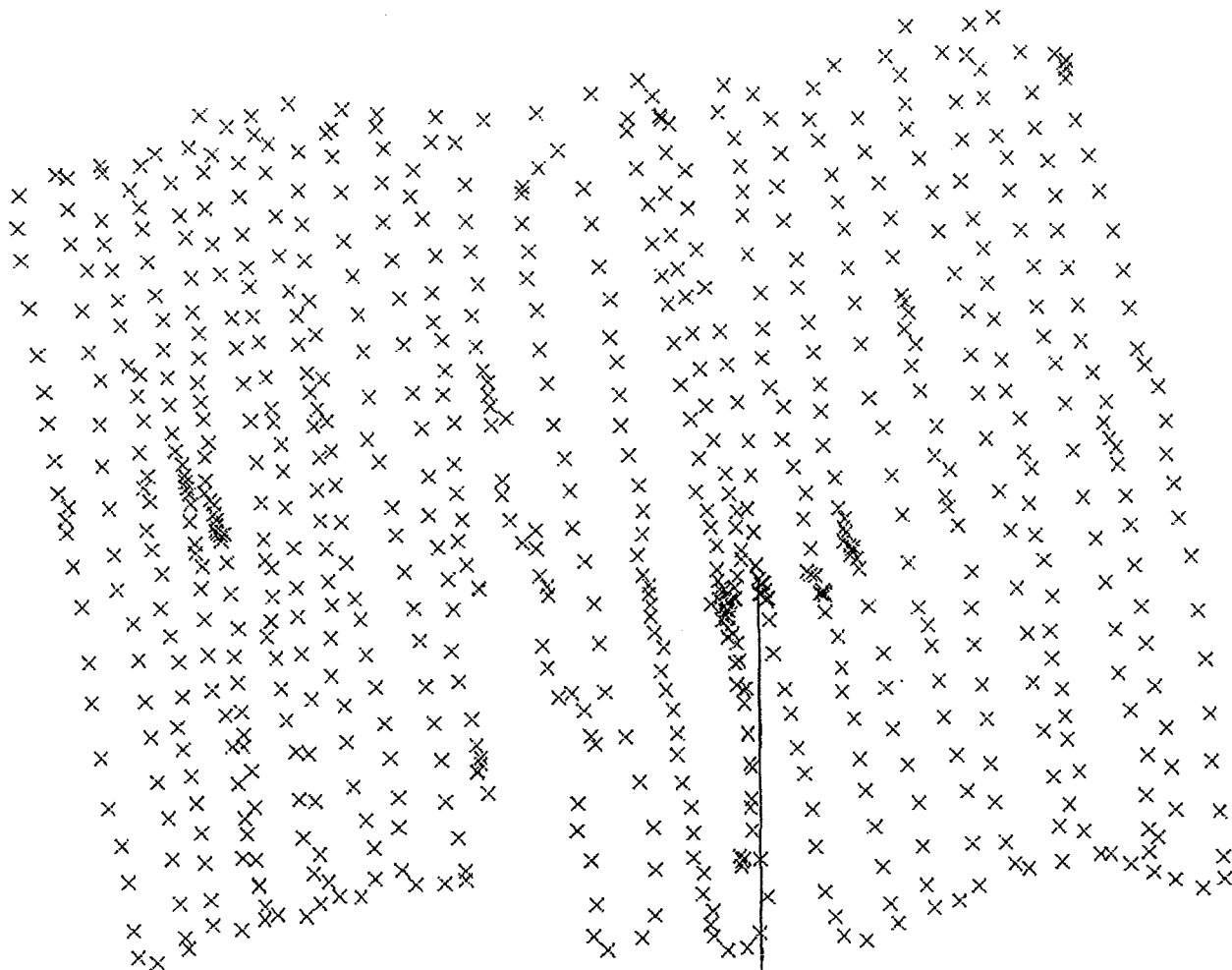


FIGURE 4
 AREA B1 AND B2
 SURFACE GAMMA SURVEY

TECHNOLOGIES, Inc.



DATA POINT 832



✓ Parking lot
DuSable Park Surface Gamma Survey 5/3/02
X 0 - 7.09
X >7.100 - 9999

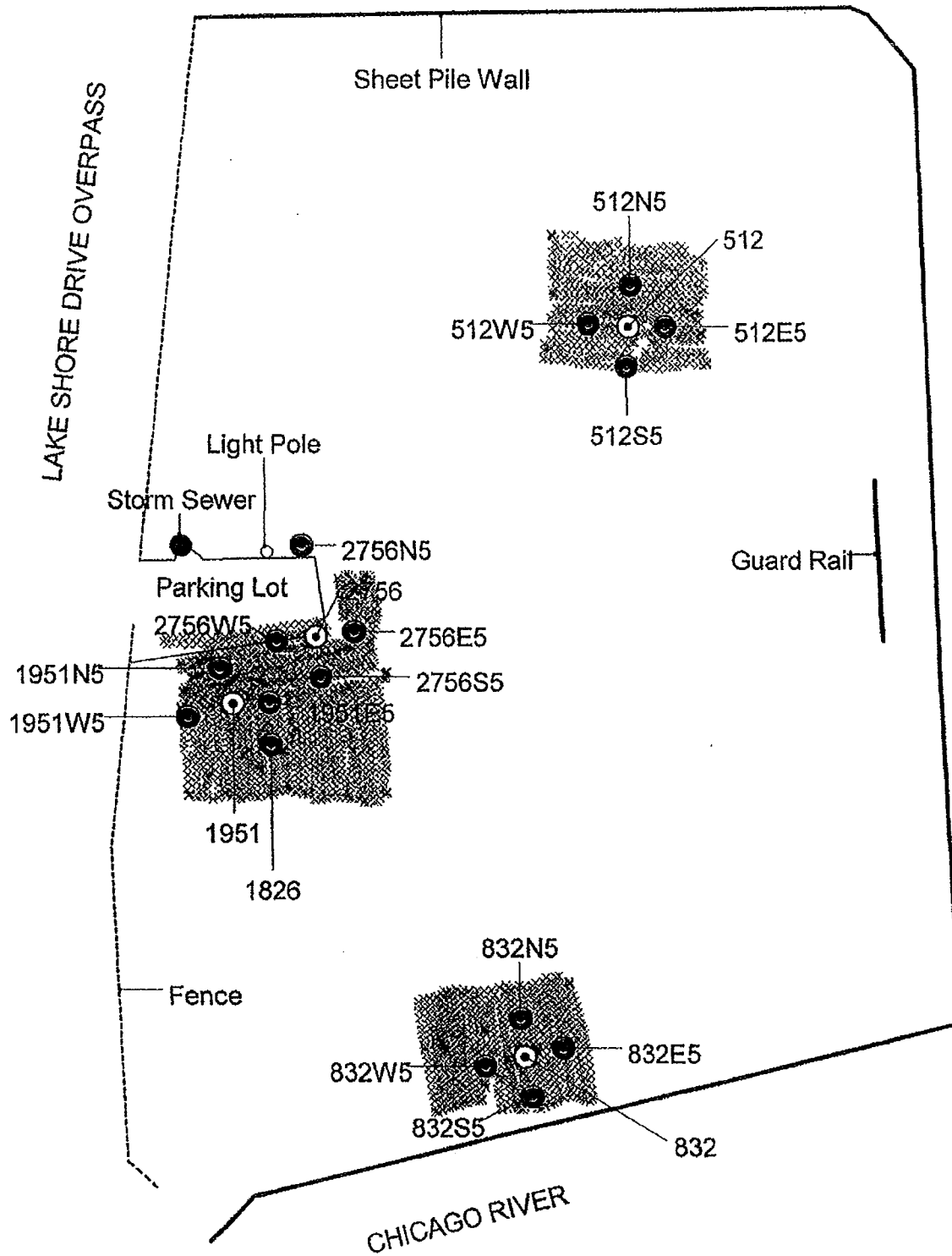
1" = 10'



FIGURE 5
AREA C
SURFACE GAMMA SURVEY

DATA SOURCE
TECHNOLOGIES, Inc.

OGDEN SLIP



Initial Testholes

Stepout Testholes

Sheet pile wall

Parking lot

DuSable Park Surface Gamma Survey 5/3/02

0 - 7.09

>7.100 - 9999

Guard rail

Fence

60 0 60 Feet

1" = 60'



FIGURE 6
DUSABLE PARK
TESTHOLE LOCATION MAP

TECHNOLOGIES, Inc.



October 23, 2007

Mr. Robert M. Baratta, Jr.
Freeborn and Peters, LLP
311 South Wacker Drive, Suite 3000
Chicago, Illinois 60606-6677

RE: Summary of Radiological Investigation at DuSable Park, Chicago, Illinois
STS Project No. 200702842

Dear Mr. Baratta:

The information below briefly describes the recent radiological surveying and excavation activities conducted in DuSable Park for the construction of an entrance ramp onto Lower North Lake Shore Drive, as well as a July surface survey of the park.

RAMP CONSTRUCTION

The entrance ramp is located just east of North Lake Shore Drive on the northern half of DuSable Park (i.e., basically the ramp extends from East North Water Street to Ogden Slip). Construction activities for the ramp required that cuts be made into the western most portion of the soil mound on the northern half of DuSable Park, as well as the excavation of about 6 feet of soil below the historical/original grade of DuSable Park. The USEPA directed the parties to conduct radiological screening of this area.

Radiological surveying during the 18-inch lift excavation process discovered an area (9 x 12 feet) about halfway between Ogden Slip and East North Water Street where elevated gamma readings between 40,000 and 76,000 counts per minute (cpm) were observed (versus a USEPA threshold of 18,740 cpm for 7.1 pCi/g total radium). The location of this area is shown on Figure 1. On Friday, October 12, an excavator bucket was used to scrape back about six inches of soil over a very limited portion of the area. This indicated the presence of a concrete slab. The excavator then broke through the slab and gamma readings taken immediately below the pad were significantly greater than those above the pad (i.e., about 123,000 cpm). Steve Kornder of STS contacted Mark Krippel of Tronox on that Friday to discuss the findings and inform him that STS intended to excavate the impacted material starting on Monday, October 15. Mr. Krippel requested that STS collect a sample of the impacted material and run a gamma spectroscopy analysis on the sample. Mr. Kornder confirmed his conversation with Mr. Krippel by e-mail on Friday.

On Monday, October 15, STS mobilized equipment to initiate the excavation of this radiologically-impacted soil. The USEPA arrived at the site at about 7AM prior to conducting any excavation activities. With the USEPA present, the excavator bucket was used to break up a larger section of the slab and expose the underlying soil. The exposed soil exhibited gamma readings >250,000 cpm. The USEPA collected a soil sample from below the concrete pad, sieved and homogenized the sample, and split the sample for analysis by both the USEPA and STS. Portions of the STS sample were containerized for both NUTRANL and gamma spectroscopy analysis. The results of the gamma spectroscopy analysis (see attached) indicated a total radium (Ra-226 plus Ra-228) concentration of about 170 pCi/g.

Excavation activities then proceeded. Radiologically-impacted material was removed from the excavation and placed directly in one cubic yard super-sacks. Approximately 24 sacks were loaded on Monday with an additional 2.5 sacks filled on Tuesday. The excavation activities suggested that the impacted soils were primarily confined to a 1.5-2 foot zone located immediately below the concrete slab. During the excavation activities, native sand was encountered at about 2-4 feet below the concrete slab. At the eastern edge of the ramp excavation, a concrete wall (footing) was also encountered. Removal of the concrete slab east of the footing also indicated the presence of radiologically-impacted soil. Survey results indicated that the impacted soil extended about 25 feet along the north/south oriented footing. Excavation activities on Tuesday basically completed the excavation of soil west of the footing.

No excavation was performed on Wednesday, although two Baker boxes were delivered to the site late in the day. Additional gamma surveys were also performed along the edges of the ramp excavation. On Thursday, work focused on the excavation of soil east of the footing. Two additional Baker boxes were delivered to the site late Thursday morning. The work east of the former footing primarily attempted to provide a clean zone sufficient to allow ramp excavation and construction to proceed. A total of three Baker boxes were filled on Thursday. On Friday morning, the USEPA collected a verification sample and split the sample with STS. Later on Friday, analysis of the STS split sample showed a total radium concentration of 3.5 pCi/g and the USEPA released the area for construction.

In summary, radiologically-impacted soil within the ramp excavation area was discovered beneath a concrete slab. The slab and associated footings apparently represent the in-place remnants of a former building structure. Soil collected by the USEPA and split with STS from just below the slab indicated a total radium concentration of about 170 pCi/g (versus the USEPA cleanup concentration of 7.1 pCi/g). The excavation of the soil in the immediate vicinity of the ramp construction area resulted in the excavation of about 60-65 cubic yards of radiologically-impacted material. This material is currently being staged at the site for future disposal.

JULY 2007 USEPA SITE VISIT AND SURVEY

In early July of this year, USEPA conducted a surface survey of the five areas on DuSable Park that had previously been the subject of some limited environmental response action by Kerr-McGee Chemical LLC. Each of these areas consisted of a shallow pit partially filled with numerous orange sand bags, which appeared to be underlain by black plastic sheets. Figure 1, attached hereto, shows the location of these areas on DuSable Park, which correspond to the areas of limited environmental response activities conducted in 2002 by Kerr-McGee Chemical LLC. STS and the USEPA both used a Ludlum meter to measure gamma counts in the vicinity of these five areas. Unshielded Ludlum readings taken from the top or edges of the sand bags in the shallow excavations are noted below.

DuSable Park Gamma Survey Results

Area	Pit	Date	Maximum Gamma Count (cpm)
A	-	7/3/2007	19,200
B	B-1	7/2/2007	15,000
	B-2	7/2/2007	21,000
	B-3	7/2/2007	19,500
C	-	7/2/2007	21,300

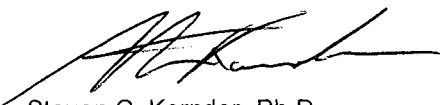
Note: Instrument threshold 18,563 cpm for 7.1 pCi/g.

Pursuant to the USEPA's direction, these five areas have been fenced with chain link fencing and/or jersey barriers with appropriate signage indicating the presence of radiologically-impacted material. Otherwise, these areas have not been disturbed.

If you have any questions or comments, please contact me at 847-279-2500.

Sincerely,

STS CONSULTANTS, LTD.


Steven C. Kornder, Ph.D.
Senior Geochemist

Attachments

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GDR/PC	RSSI High Resolution Gamma Spectroscopy	Ver. 6.02a
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Sample ID : 072092 STS 716G EPA# 107062 & 107063

Sample Size 7.16e+002 g	Spectrum File . . h:maestros/072092.chn
Sampling Start. 00-00-00 00:00	Counting Start. 10-15-07 12:00
Sampling Stop 00-00-00 00:00	Live Time 3600 Sec
Current Date. 00-00-00 00:00	Real Time 3731 Sec

Detector #: 1

Energy(keV)= 4.53 + 0.238*Ch + 0.00e+000*Ch^2 + 0.00e+000*Ch^3 10-15-07 12:00

FWHM(keV) = 0.94 + 0.015*En + 2.91e-004*En^2 + 0.00e+000*En^3 08-13-07 15:28

Where En = Sqrt(Energy in keV)

Sensitivity 0.20 | Search Start / End. 0 / 8191

Sigma Multiplier. 1.00 |

PEAK SEARCH RESULTS

PK. #	ENERGY (keV)	ADDRESS CHANNEL	NET COUNTS	UN- CERTAINTY	C.L. COUNTS	BKG COUNTS	FWHM (keV)	FLAG
1	74.65	295.24	16302	381	733	29976	1.19	a
2	76.90	304.70	25748	344	602	25795	1.04	b
3	84.28	335.76	4850	420	877	29649	1.40	a
4	87.02	347.30	15183	384	746	29399	1.37	b
5	89.76	358.85	11323	335	637	26061	1.21	c
6	93.14	373.08	12043	394	794	27282	1.32	d
7	99.28	398.91	3511	305	595	24435	1.24	
8	105.19	423.82	5326	438	910	34069	1.63	a
9	108.54	437.92	1649	324	650	25512	1.17	b
10	115.02	465.20	1734	296	576	24458	1.07	
11	128.96	523.90	8802	329	620	28363	1.11	
12	154.01	629.34	2453	299	580	24788	0.90	
13	186.08	764.38	3773	292	567	22197	1.45	
14	209.18	861.62	14281	297	541	20208	1.16	
15	238.59	985.44	155661	498	628	19477	1.21	a
16	241.13	996.13	15973	291	530	17190	1.31	b
17	252.73	1044.97	464	196	383	10800	0.76	
18	270.20	1118.54	10941	227	404	10605	1.27	
19	277.35	1148.62	6479	217	403	10577	1.25	
20	288.01	1193.50	1249	201	399	9795	1.62	
21	295.18	1223.72	7118	208	388	8349	1.11	a
22	300.08	1244.31	8886	211	383	8589	1.14	b
23	321.30	1333.67	472	176	351	8001	0.83	
24	327.95	1361.65	7992	232	451	8187	1.25	a
25	332.40	1380.38	924	164	322	6891	1.10	b
26	338.28	1405.15	31274	254	373	7703	1.30	c
27	340.95	1416.42	958	180	368	6630	1.12	d
28	351.90	1462.50	12786	198	325	6848	1.28	
29	409.38	1704.51	4493	159	289	5417	1.48	
30	452.98	1888.05	905	141	278	4761	1.65	

31	463.00	1930.26	8687	166	278	4731	1.36	
32	510.78	2131.43	13857	190	300	5529	1.53	
33	562.59	2349.52	1539	141	277	4240	1.47	
34	583.26	2436.58	45976	256	283	4658	1.45	
35	609.40	2546.61	8970	156	253	3718	1.46	
36	727.39	3043.36	10134	152	232	2983	1.70	
37	755.46	3161.55	1389	116	224	2763	1.57	
38	763.47	3195.29	726	130	270	2750	1.44	a
39	768.51	3216.49	646	90	172	2057	1.15	b
40	772.42	3232.96	1823	126	250	2552	1.52	c
41	782.50	3275.38	515	95	191	1871	1.22	a
42	785.66	3288.70	1343	109	213	2238	1.51	b
43	795.10	3328.46	5342	116	184	1873	1.60	
44	806.73	3377.40	150	89	181	1807	1.20	NET < CL
45	830.79	3478.70	627	110	228	1792	1.65	a
46	835.90	3500.23	2030	99	183	1684	1.63	b
47	840.44	3519.36	1193	102	204	1591	1.64	c
48	860.72	3604.72	5204	109	168	1484	1.57	
49	893.74	3743.76	595	80	158	1204	2.79	
50	904.35	3788.40	839	99	203	1402	1.75	a
51	911.35	3817.90	31940	197	178	1231	1.69	b
52	934.22	3914.18	284	71	141	1097	1.37	
53	952.61	3991.59	117	63	127	931	1.24	NET < CL
54	958.85	4017.88	291	78	161	973	1.48	a
55	964.99	4043.72	5812	107	156	1114	1.81	b
56	969.14	4061.17	18190	156	169	1032	1.71	c
57	988.52	4142.78	176	68	139	928	2.01	
58	1033.12	4330.54	188	62	124	816	1.73	
59	1065.40	4466.45	190	60	119	783	1.69	
60	1079.00	4523.71	514	61	115	727	1.83	
61	1094.41	4588.61	424	69	138	909	1.86	
62	1111.04	4658.61	511	67	131	796	1.76	
63	1120.50	4698.44	1810	76	129	840	2.02	
64	1154.89	4843.25	277	73	149	945	2.31	
65	1238.40	5194.82	655	67	129	797	1.94	
66	1247.17	5231.75	336	69	137	942	2.01	
67	1377.79	5781.68	346	64	126	796	1.24	
68	1408.25	5909.92	227	65	133	754	2.32	
69	1460.22	6128.74	1224	72	134	709	3.42	
70	1496.03	6279.47	833	63	120	476	2.03	a
71	1501.80	6303.78	383	55	109	468	1.74	b
72	1509.57	6336.49	179	56	115	525	1.83	a
73	1513.33	6352.34	161	51	103	485	1.49	b
74	1557.30	6537.46	140	49	99	475	1.70	
75	1580.61	6635.58	447	59	117	461	1.72	a
76	1588.41	6668.42	2456	76	122	593	2.04	b
77	1592.68	6686.39	1977	84	156	668	2.21	c
78	1620.87	6805.09	1017	71	136	539	1.73	a
79	1625.25	6823.52	229	60	123	540	1.86	b
80	1630.87	6847.18	1210	65	115	531	2.06	c
81	1638.52	6879.38	334	66	139	503	2.21	d
82	1729.70	7263.28	301	49	95	400	2.49	
83	1764.69	7410.59	1368	64	110	538	2.19	
84	1847.51	7759.28	183	55	113	527	1.73	

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GDR/PC	RSSI High Resolution Gamma Spectroscopy	Ver. 6.02a
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BACKGROUND SUBTRACT RESULTS

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Sample ID : 072092 STS 716G EPA# 107062 & 107063

Bkg File:H:\GDR\BKG\NOCAL.BKG Counting Start.	10-15-07 12:00
ID:. 24 Hour Background Current Date	00-00-00 00:00

PK#	ENERGY (keV)	FWHM (keV)	OLD NET COUNTS	OLD UN- CERTAINTY	NEW NET COUNTS	NEW UN- CERTAINTY	FLAG
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1	74.65	1.19	16302	381	16242	381	
3	84.28	1.40	4850	420	4829	420	
6	93.14	1.32	12043	394	11993	394	
13	186.08	1.45	3773	292	3744	292	
15	238.59	1.21	155661	498	155631	498	
21	295.18	1.11	7118	208	7091	208	
28	351.90	1.28	12786	198	12730	198	
32	510.78	1.53	13857	190	13770	190	
34	583.26	1.45	45976	256	45953	256	
35	609.40	1.46	8970	156	8876	156	
51	911.35	1.69	31940	197	31917	198	
56	969.14	1.71	18190	156	18178	156	
63	1120.50	2.02	1810	76	1794	76	
69	1460.22	3.42	1224	72	1039	72	
83	1764.69	2.19	1368	64	1348	64	

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NUCLIDE ACTIVITY SUMMARY

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Sample ID: 072092 STS 716G EPA# 107062 & 107063

Sample Size 7.16e+002 g | Spectrum File . . h:maestros/072092.chn
 Sampling Start. 00-00-00 00:00 | Counting Start. 10-15-07 12:00
 Sampling Stop 00-00-00 00:00 | Buildup Time. 0.00e+000 Hrs
 Current Date. 00-00-00 00:00 | Decay Time [OFF]. 0.00e+000 Hrs

Efficiency File: H:\GDR\EFF\500MAR.EFF | Library File. . . . H:\GDR\LIB\1001.LIB
 ID. 500 MARINELLI | ID. TH, U, AND K SERIES

Eff.= 1/[4.50e-002*En^-2.60e+000 + 1.35e+002*En^8.70e-001] 08-14-07 16:35

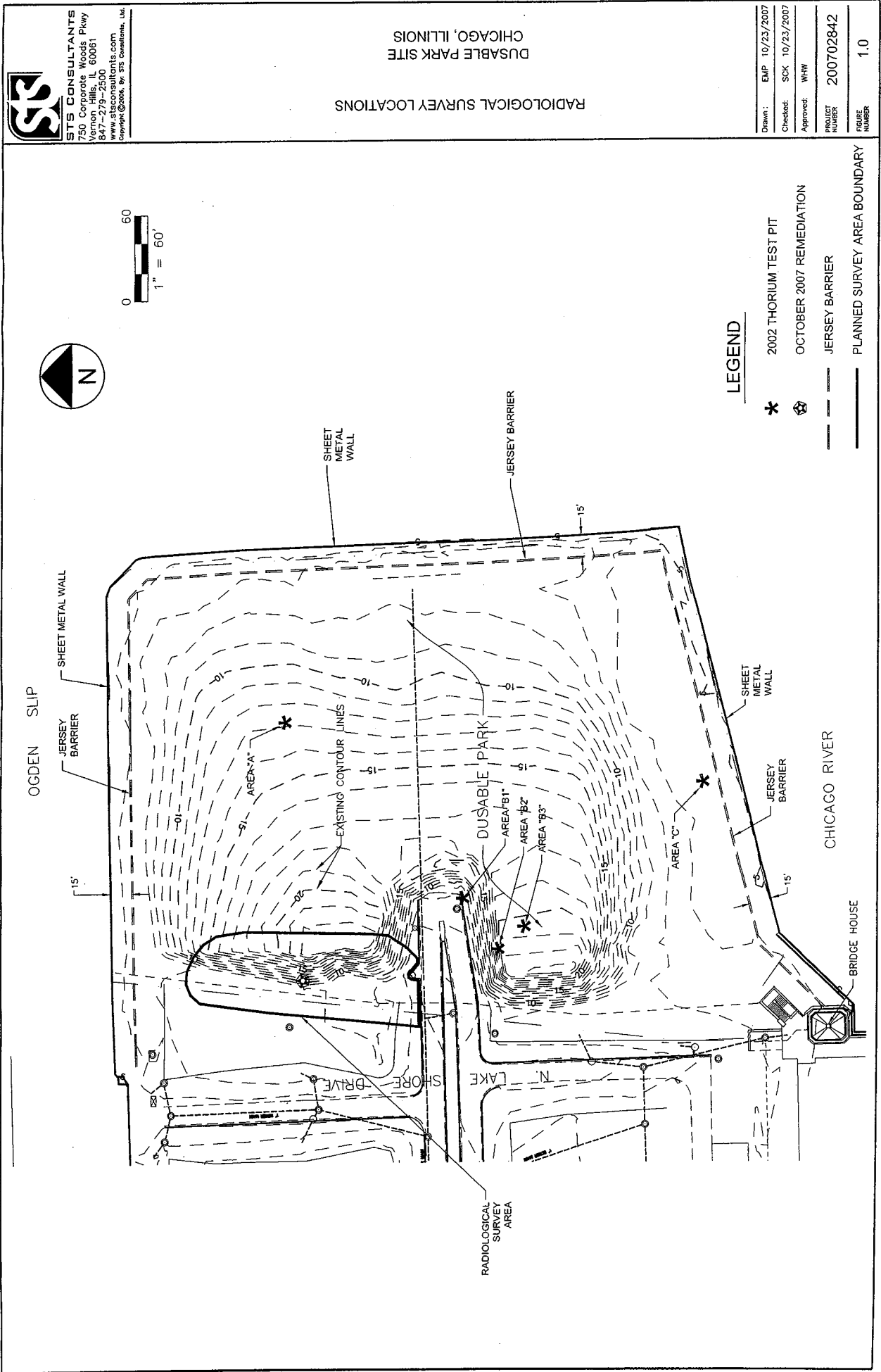
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <= 8.000 Halflives
 Library Energy Tolerance. . . 1.20

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +/- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Pb-212	Average:	1.48e-004 +-4.70e-007	1.06e+001	4 of 4
	74.82	I.D.Only		
	77.11	I.D.Only		
	238.63	1.49e-004 +-4.76e-007		
	300.09	1.32e-004 +-3.14e-006		
Pb-214	Average:	1.95e-005 +-2.64e-007	4.47e-001	4 of 4
	77.11	I.D.Only		
	241.98	1.98e-005 +-1.67e-006		
	295.21	1.85e-005 +-5.41e-007		
	351.92	1.98e-005 +-3.07e-007		
Th-228	84.37	I.D.Only	1.68e+004	1 of 2
Th-234	92.80	I.D.Only	5.78e+002	1 of 3
Pa-234	98.44	I.D.Only	6.70e+000	1 of 4
Pa-234m	98.44	I.D.Only	1.95e-002	1 of 4
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ra-224	240.98	1.36e-004 +-3.17e-006	8.69e+001	1 of 1
Tl-208	Average:	4.86e-005 +-2.48e-007	5.09e-002	3 of 3
	277.35	4.55e-005 +-1.52e-006		
	510.84	5.06e-005 +-6.97e-007		
	583.14	4.84e-005 +-2.69e-007		
Bi-212	Average:	1.60e-004 +-2.30e-006	1.01e+000	4 of 4
	288.07	1.93e-004 +-3.11e-005		
	727.17	1.61e-004 +-2.42e-006		
	785.46	1.40e-004 +-1.14e-005		
	1620.60	1.47e-004 +-1.02e-005		
Ac-228	Average:	1.51e-004 +-6.48e-007	6.13e+000	3 of 3
	338.32	1.54e-004 +-1.25e-006		
	911.07	1.51e-004 +-9.31e-007		

19.5 pCi/g Ra-226

151 pCi/g Ra-228



FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: DuSable Park - Grid S-T/14-15

Date of Verification Survey: 10/19/07

Time of Verification Survey: 11AM

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: 

Date: 10/19/07

Print Name: Steven C. Kornder

Print Title: Senior Project Geochemist

STS Consultants, Ltd.

The attached Verification Survey documents were reviewed by USEPA, Region 5 on October 19, 2007. The results of this survey indicate that the verification criteria as contained in the UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date October 19, 2007 (5:41PM)

Print Name Eugene Jablonowski

Print Title Health Physicist For Verneta Simon

For USEPA Region 5

Nutranl Gamma Spec Report- DuSable Park

Exclusion Zone Confirmatory Samples for October 19, 2007

Sample ID	Sample Date	Sample Group	Description	Weight	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
1534	10/19/2007	DuSable EPA	S-T/14-15 EPA #1	35.9	6.48	3.76	-0.24	1.12	3.69	1.5	3.45	1.872004273
1535	10/19/2007	DuSable EPA	S-T/14-15 EPA #2	37.8	3.69	4.43	1.19	1.36	2.45	1.77	3.64	2.232151429
1536	10/19/2007	DuSable EPA	S-T/14-15 EPA #3	34.5	11.08	3.86	0.74	1.11	1.89	1.48	2.63	1.85
1537	10/19/2007	DuSable EPA	S-T/14-15 EPA #4	35.4	6.73	5.28	2.04	1.55	0.55	2.02	2.59	2.546153962
1538	10/19/2007	DuSable EPA	S-T/14-15 EPA #5	35.3	4.1	3.4	1.8	1.05	3.28	1.36	5.08	1.718167629
Average Total Radium (Th-232+Ra-226) Concentration for :										S-T/14-15		
										3.48 pCi/g		

Personal Air Monitoring Summary Sheet (PAM's -Daily Analysis) **October 15, 2007 - October 26, 2007**
STS Consultants - DuSable Park

*** All PAM's with counts over background on day after analysis are recounted after 4 days (see attached)

Date Collected	Name	Sample ID	PAM #	Flow Rate (lpm)	Total Time Sampled	Total Sample Volume (ml)	Analysis Date	Gross Counts (30 min)	Bkg Counts (30 min)	Net CPM	Sample Concentration (uCi/ml)
10/15/2007	Andre Gore	DP001	002-675	2.5	445	1112500	10/16/2007	18	9	0.30	7.27E-14 *
10/15/2007	Glenn Huber	DP002	002-766	2.5	445	1112500	10/16/2007	16	9	0.23	5.66E-14 *
10/16/2007	Andre Gore	DP003	002-675	2.5	415	1037500	10/17/2007	13	13	0.00	0.00E+00
10/16/2007	Glenn Huber	DP004	002-766	2.5	415	1037500	10/17/2007	12	13	0.00	0.00E+00
10/18/2007	Andre Gore	DP005	002-675	2.5	465	1162500	10/19/2007	14	10	0.13	3.09E-14 *
10/18/2007	Glenn Huber	DP006	002-766	2.5	465	1162500	10/19/2007	9	10	0.00	0.00E+00
10/26/2007	Andre Gore	DP007	002-675	2.5	345	862500	10/27/2007	10	13	0.00	0.00E+00
10/26/2007	Glenn Huber	DP008	002-766	2.5	345	862500	10/27/2007	12	13	0.00	0.00E+00

Note: Official airborne Th-232 concentrations are obtained from 4 Day Analysis.

See attached 4 Day Analysis Form for Occupational Dose Limit Information.

Personal Air Monitoring Summary Sheet (PAM's -4 Day Analysis) October 15, 2007 - October 19, 2007
 STS Consultants - DuSable Park

***Note: All samples on this page were analyzed after 4 days to allow for thorium daughter decay

Date Collected	Name	Sample ID	PAM #	Flow Rate (lpm)	Total Time Sampled	Total Sample Volume (ml)	Analysis Date	Gross Counts (30 min)	Bkg Counts (30 min)	Net CPM	Sample Concentration (uCi/ml)	% of DAC
10/15/2007	Andre Gore	DP001	002-675	2.5	445	1112500	10/19/2007	10	10	0.00	0.00E+00	0.00%
10/15/2007	Glenn Huber	DP002	002-766	2.5	445	1112500	10/19/2007	9	10	0.00	0.00E+00	0.00%
10/18/2007	Andre Gore	DP005	002-675	2.5	465	1162500	10/22/2007	8	12	0.00	0.00E+00	0.00%

Area Air Monitoring Summary Sheet - Staplex High Volume Pumps (Daily Analysis)
STS - DuSable Park Proj Chicago, IL

Thursday October 18, 2007

Sample ID	date sampled	start time	stop time	total time sampled	cubic ft/ min (CFM)	sample volume analyzed	day after analysis					four day analysis					% of Limit 4.00E-15 uCi/ml
							date analyzed	gross counts	bkg counts	net cpm	Concentration in uCi/ml	date analyzed	gross counts	bkg counts	net cpm	Concentration in uCi/ml	
DP001	10/18/2007	7:55am	2:35pm	400	46	1.82E+07	10/19/2007	82	10	2.4	5.07E-14	10/22/2007	12	12	0	0.00E+00	0.00%

DuSable Park - OVERBURDEN STOCKPILE SAMPLING

OVERBURDEN SOIL

Using USEPA approved procedure SOP 214 *Workplan for Investigation and Removal of Radiologically Impacted So (Revised September 30, 2002)*

Excavation Area: S-T / 14-15

Date Sampled: 10/18/2007

Number of Samples
Required Per SOP 214:

PILE # : **North Road** Est. Volume of Lift in Cubic Yards: 15

3

Sample #	Total Radium in pCi/g	QC Sample Dup. Tot. Rad. in pCi/g	E lab uncertainty	S ₂ Std. Dev. for the analyses of the duplicate sample	S _{dup} Std. Dev. of the duplicate sampling & measurement
S2405 S-T/14-15 OB#1	2.30				
S2406 S-T/14-15 OB#2	2.74				
S2407 S-T/14-15 OB#3	2.40				
S2408 S-T/14-15 OB QC		2.76	2.82	1.41	
Number of Samples (n)	3			S _{dup} = sqrt (S ₁ ² + S ₂ ²) =	1.43
Average (Mean of the sample population) (X bar)	2.48				

Average of samples is <7.1 pCi/g, Proceed with Confidence Level Check described in SOP-214, Paragraph 6.12	
Standard Deviation of sample population (S ₁)	0.23
U _α (True Mean) = (X bar) + (t * (S ₁ /sqrt(n))) Where "t" is a statistic used for small sample tests of hypotheses (the Student Distribution), from SOP No. KMS-102, Attachment 10.6	2.87
Release Criteria	7.1
U _α < Release Criteria?	
SAMPLES TESTED MEET 95% CONFIDENCE LEVEL - LIFT IS RADIOLOGICALLY ACCEPTABLE FOR USE AS ONSITE BACKFILL PER SOP-214	

Check if QC Sample Dup. is within 3 Standard Deviations (3 S _{dup}) of the mean of the sample population, per SOP 214, paragraph 12.1	
3 x S _{dup} =	4.29
Mean + 3 S _{dup} =	6.8
Mean - 3 S _{dup} =	-1.8
QC < (Mean + 3S _{dup})?	O.K.
QC > (Mean - 3S _{dup})?	O.K.

APPROVED: FIELD TEAM LEADER: _____

APPROVED: PROJECT MANAGER: _____

Name/date

RADIATION SURVEY FORM

SURVEY REFERENCE #: *Asphalt Park / S-T/14/15 cleanup*

DATE OF SURVEY: 10/19/07

NAME OF SURVEYOR: Glen Huber

SURVEY METER IDENTIFICATION:

Mfg: Ludlum

Background Reading: 0.02 mR/hr

Model: 4C

Serial: 75056

INSTRUMENT ID:

Mfg: Ludlum

Background Reading: 0.3 cpm

Model: 2200 (scaler) / 43-10 (alpha)

Efficiency: 0.334 %

Serial: 162770

MDA: _____ dpm

[illegible]

sahci

CHAIN OF CUSTODY


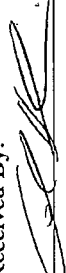
Stan A. Huber Consultants, Inc.
200 N. Cedar Rd.
New Lenox, IL 60451
(815) 485-6161
Fax (815) 485-4433

Results Company STS Consultants, Inc.
To: Name Steve Kornder
Address 750 Corporate Woods Pkwy.
City Vernon Hills ST IL Zip 60061
Phone (847) 279-2448 Fax (847) 279-2510

Bill To: Company STS Consultants, Inc.
Name Steve Kornder
Address 750 Corporate Woods Pkwy.
City Vernon Hills ST IL Zip 60061

Company		STS Consultants, Inc.		P. O.		Analysis Ordered			
Client Contact		Steve Kornder		#		NUTRANL			
Address		750 Corporate Woods Pkwy.		Project #		1-32193-XC			
City		Vernon Hills ST IL Zip 60061		Project ID:		D-5654 P-1			
Phone		(847) 279-2448 Fax (847) 279-2510							
Sample I.D. Location	Sample Type	Container Size	Container Type	Container Number	Sampling Date	Sampling Time	Lab I.D.	Comments/Description	
5-7/14-15 E21	Soil	20 ml	Plastic Vial	52402	10/15/67				
5-7/14-15 E22	↓	↓	↓	52403	↓			Exclusion Zone	
5-7/14-15 E2 comp	↓	↓	↓	52404	↓			Exclusion Zone	
5-7/14-15 OB #1	Soil	20 ml	PV	52405	10/16/67				
5-7/14-15 OB #2	↓	↓	↓	52406	↓			Exclusion Zone	
5-7/14-15 OB #3	↓	↓	↓	52407	↓			Over-saturated Sample	
5-7/14-15 OB OC	↓	↓	↓	52408	↓				

Chain-of-Possession

Relinquished By:	Received By:	Date/Time	Relinquished By:	Received By:	Date/Time
		10/19/67			
Relinquished By:	Received By:	Date/Time	Relinquished By:	Received By:	Date/Time
Relinquished By:	Received By:	Date/Time	Relinquished By:	Received By:	Date/Time

REGION 5
77 West Jackson Boulevard
Chicago, Illinois 60604

Activity Code:

EPA No. 107085.66, 67, 68, 69
15-62253

Nutranl Gamma Spec Report- DuSable Park

Summary Report 10/19-26/07

Sample ID	Analysis Date	Sample Group	Description	Weight	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
1532	10/19/2007	background	bkg101907	7.5	3.71	3.62	-0.6	1.09	1.1	1.47	0.5	1.83
1533	10/19/2007	soil standard	soilstd101907	36.9	9.39	5.3	4.53	1.54	3.91	1.99	8.44	2.52
1534	10/19/2007	DuSable EPA	S-T/14-15 EPA #1	35.9	6.48	3.76	-0.24	1.12	3.69	1.5	3.45	1.87
1535	10/19/2007	DuSable EPA	S-T/14-15 EPA #2	37.8	3.69	4.43	1.19	1.36	2.45	1.77	3.64	2.23
1536	10/19/2007	DuSable EPA	S-T/14-15 EPA #3	34.5	11.08	3.86	0.74	1.11	1.89	1.48	2.63	1.85
1537	10/19/2007	DuSable EPA	S-T/14-15 EPA #4	35.4	6.73	5.28	2.04	1.55	0.55	2.02	2.59	2.55
1538	10/19/2007	DuSable EPA	S-T/14-15 EPA #5	35.3	4.1	3.4	1.8	1.05	3.28	1.36	5.08	1.72
1539	10/20/2007	background	bkg102007	7.5	8.37	3.45	-0.26	0.97	0.42	1.3	0.16	1.62
1540	10/20/2007	soil standard	soilstd102007	36.9	11.07	4.26	4.8	1.25	3.72	1.59	8.52	2.02
1541	10/20/2007	DuSable Park	S2402 S-T/14-15 EZ1	27.3	35.25	52.55	175.95	15.12	29.02	18.53	205	23.9
1542	10/20/2007	DuSable Park	S2403 S-T/14-15 EZ2	48.2	-7103.51	1552.46	3481.4	512.09	1301.6	647.95	4783	826
1543	10/20/2007	DuSable Park	S2404 S-T/14-15 EZ COMP	30.6	6.81	58.57	209.05	16.92	29.72	20.74	239	26.8
1544	10/20/2007	DuSable Park	S2405 S-T/14-15 OB#1	30.5	12.74	5.53	1.74	1.54	0.56	1.98	2.30	2.51
1545	10/20/2007	DuSable Park	S2406 S-T/14-15 OB#2	29.9	5.96	6.09	-0.5	1.79	3.24	2.51	2.74	3.08
1546	10/20/2007	DuSable Park	S2407 S-T/14-15 OB#3	28.7	7.05	4.52	1.7	1.32	0.7	1.66	2.40	2.12
1547	10/20/2007	DuSable Park	S2408 S-T/14-15 OB QC	28.3	7.61	5.77	1.13	1.67	1.63	2.28	2.76	2.83
1548	10/27/2007	background	bkg102707	7.5	2.5	3.31	0.64	1.01	-0.94	1.27	-0.30	1.62
1549	10/27/2007	soil standard	soilstd102707	36.9	4.29	6.29	3.86	1.95	4.09	2.46	7.95	3.14
1550	10/27/2007	DuSable EPA	R-S/14-15 EPA#1	34.1	10.39	5.83	2.52	1.66	2.27	2.19	4.79	2.75
1551	10/27/2007	DuSable EPA	R-S/14-15 EPA#2	34.4	10.63	4.69	1	1.34	3.88	1.84	4.88	2.28
1552	10/27/2007	DuSable EPA	R-S/14-15 EPA#3	35	4.66	6.27	3.51	1.84	1.95	2.43	5.46	3.05
1553	10/27/2007	DuSable EPA	R-S/14-15 EPA#4	35.6	6.01	4.83	4.62	1.43	1.74	1.82	6.36	2.31
1554	10/27/2007	DuSable EPA	R-S/14-15 EPA#5	34.5	3.59	5.32	2.77	1.61	2.33	2.09	5.10	2.64
1555	10/27/2007	DuSable Exclusion Zone	R-S/14-15 EZ	34.4	26.04	14.85	36.17	4.27	3.33	5.09	39.5	6.64

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEYArea Identification: DuSable Park - Grid R-S/14-15Date of Verification Survey: 10/26/07Time of Verification Survey: 12:30PM

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: Date: 10/26/07Print Name: Steven C. KornderPrint Title: Senior Project Geochemist

STS Consultants, Ltd.

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 10/29/07. The results of this survey indicate that the verification criteria as contained in the UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date: 10/29/07Print Name: Verneta SimonPrint Title: On-Scene Coordinator

For USEPA Region 5

Nutranl Gamma Spec Report- DuSable Park

Exclusion Zone Confirmatory Samples for October 26, 2007

Sample ID	Analysis Date	Sample Group	Description	Weight	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
1550	10/27/2007	DuSable EPA	R-S/14-15 EPA#1	34.1	10.39	5.83	2.52	1.66	2.27	2.19	4.79	2.748035662
1551	10/27/2007	DuSable EPA	R-S/14-15 EPA#2	34.4	10.63	4.69	1	1.34	3.88	1.84	4.88	2.276224945
1552	10/27/2007	DuSable EPA	R-S/14-15 EPA#3	35	4.66	6.27	3.51	1.84	1.95	2.43	5.46	3.048032152
1553	10/27/2007	DuSable EPA	R-S/14-15 EPA#4	35.6	6.01	4.83	4.62	1.43	1.74	1.82	6.36	2.314584196
1554	10/27/2007	DuSable EPA	R-S/14-15 EPA#5	34.5	3.59	5.32	2.77	1.61	2.33	2.09	5.1	2.638219096
Average Total Radium (Th-232+Ra-226) Concentration for										5.32	pCi/g	

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: DuSable Park - N-O/10-11 (Eastern end of E. North Water)

Date of Verification Survey: 11/16/07

Time of Verification Survey: 3PM

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: [Signature]

Date: 11/17/07

Print Name Steve Kornder

Print Title Senior Project Geochemist

STS

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 11/17/2007. The results of this survey indicate that the verification criteria, as contained UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date 11/17/2007

Print Name Eugene Jablonowski, HP

Print Title Health Physicist

For USEPA Region 5

Nutranl Gamma Spec Report- DuSable Park

Exclusion Zone Confirmatory Samples for November 16, 2007

Sample ID	Analysis Date	Sample Group	Description	Weight	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
1558	11/16/2007	DuSable Park EPA	N-O/10-11 EPA #1	32.5	4.68	3.88	0.79	1.17	1.78	1.54	2.57	1.934037228
1559	11/16/2007	DuSable Park EPA	N-O/10-11 EPA #2	32.6	6.79	5.12	0.82	1.5	1.97	1.96	2.79	2.468116691
1560	11/16/2007	DuSable Park EPA	N-O/10-11 EPA #3	33.3	4.87	2.83	1.3	0.84	3.03	1.12	4.33	1.4
1561	11/16/2007	DuSable Park EPA	N-O/10-11 EPA #4	32.9	7.23	5.34	0.52	1.58	2.47	2.06	2.99	2.596150997
1562	11/16/2007	DuSable Park EPA	N-O/10-11 EPA #5	33.6	9.13	5.19	1.29	1.5	3.14	2	4.43	2.5
Average Total Radium (Th-232+Ra-226) Concentration for					N-O/10-11		3.42		pCi/g			

Personal Air Monitoring Summary Sheet (PAM's -Daily Analysis) **October 15, 2007 - November 16, 2007**
 STS Consultants - DuSable Park

*** All PAM's with counts over background on day after analysis are recounted after 4 days (see attached)

Date Collected	Name	Sample ID	PAM #	Flow Rate (lpm)	Total Time Sampled	Total Sample Volume (ml)	Analysis Date	Gross Counts (30 min)	Bkg Counts (30 min)	Net CPM	Sample Concentration (uCi/ml)
10/15/2007	Andre Gore	DP001	002-675	2.5	445	1112500	10/16/2007	18	9	0.30	7.27E-14 *
10/15/2007	Glenn Huber	DP002	002-766	2.5	445	1112500	10/16/2007	16	9	0.23	5.66E-14 *
10/16/2007	Andre Gore	DP003	002-675	2.5	415	1037500	10/17/2007	13	13	0.00	0.00E+00
10/16/2007	Glenn Huber	DP004	002-766	2.5	415	1037500	10/17/2007	12	13	0.00	0.00E+00
10/18/2007	Andre Gore	DP005	002-675	2.5	465	1162500	10/19/2007	14	10	0.13	3.09E-14 *
10/18/2007	Glenn Huber	DP006	002-766	2.5	465	1162500	10/19/2007	9	10	0.00	0.00E+00
10/26/2007	Andre Gore	DP007	002-675	2.5	345	862500	10/27/2007	10	13	0.00	0.00E+00
10/26/2007	Glenn Huber	DP008	002-766	2.5	345	862500	10/27/2007	12	13	0.00	0.00E+00
11/16/2007	Andre Gore	DP009	002-675	2.5	130	325000	11/19/2007	8	11	0.00	0.00E+00
11/16/2007	Glenn Huber	DP010	002-766	2.5	130	325000	11/19/2007	11	11	0.00	0.00E+00

Note: Official airborne Th-232 concentrations are obtained from 4 Day Analysis.

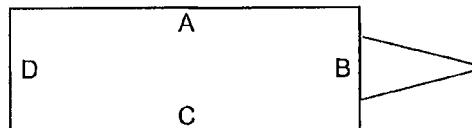
See attached 4 Day Analysis Form for Occupational Dose Limit Information.

Container Shipping Survey Form

Project ID: DuSable Park

Date: 10/31/07	Survey #: DP001	Technician Name: Glenn Haber	
Container Number: BKRU 026270	Alpha Inst. Ludlum Model 2200 S/N 102770 w/ Model 43-10 Detector	BKG 0.3 gpm	Beta/Gamma Inst. Ludlum Model 3 S/N 110805 w/ Model 44-38 Energy Comp G-M Probe
			BKG 0.02 mR/hr

Shipping Container



Gamma Readings

Highest Contact Reading on Each Side		
Side A	0.03	mRem/hr
Side B	0.02	mRem/hr
Side C	0.03	mRem/hr
Side D	0.02	mRem/hr
Average	0.025	mRem/hr

Surface Contamination

Smear #	Location	DPM/100 cm ²
1	Top	0
2	Bottom	0
3	Side A	< 7.5
4	Side B	0
5	Side C	0
6	Side D	< 7.5

Highest 1 meter dose rate	Bkg	mR/hr
Highest contact dose rate	0.03	mR/hr
Highest smear result	< 7.5	DPM/100 cm ²

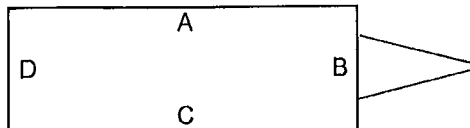
Approved for Shipment by: <u>Glenn Haber</u> HP Technician	Date: 10/31/07
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Container Shipping Survey Form

Project ID: DuSable Park

Date: 10/31/07	Survey #: DP002	Technician Name: Glen Huber	
Container Number: BKRU Ø12534	Alpha Inst. Ludlum Model 2200 S/N 102770 w/ Model 43-10 Detector	BKG 0.3cpm	Beta/Gamma Inst. Ludlum Model 3 S/N 110805 w/ Model 44-38 Energy Comp G-M Probe
			BKG 0.02 mR/hr

Shipping Container



Gamma Readings

Highest Contact Reading on Each Side		
Side A	0.08	mRem/hr
Side B	0.03	mRem/hr
Side C	0.05	mRem/hr
Side D	0.03	mRem/hr
Average	0.0475	mRem/hr

Surface Contamination

Smear #	Location	DPM/100 cm ²
1	Top	< 7.5
2	Bottom	0
3	Side A	< 7.5
4	Side B	< 7.5
5	Side C	< 7.5
6	Side D	0

Highest 1 meter dose rate	Bkg	mR/hr
Highest contact dose rate	0.08	mR/hr
Highest smear result	< 7.5	DPM/100 cm ²

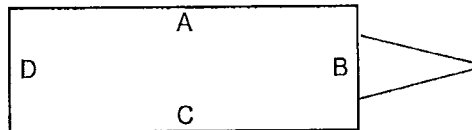
Approved for Shipment by: <u>Glen Huber</u> <div style="text-align: center; font-size: small;">HP Technician</div>	Date: <u>10/31/07</u>
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Container Shipping Survey Form

Project ID: DuSable Park

Date: 10/31/07	Survey #: DP003	Technician Name: Glen Huber	
Container Number: BKRU 012605	Alpha Inst. Ludlum Model 2200 S/N 102770 w/ Model 43-10 Detector	BKG 0.3 cpm	Beta/Gamma Inst. Ludlum Model 3 S/N 110805 w/ Model 44-38 Energy Comp G-M Probe
		BKG 0.02 mR/hr	

Shipping Container



Gamma Readings

Highest Contact Reading on Each Side		
Side A	0.06	mRem/hr
Side B	0.03	mRem/hr
Side C	0.04	mRem/hr
Side D	0.04	mRem/hr
Average	0.0425	mRem/hr

Surface Contamination

Smear #	Location	DPM/100 cm ²
1	Top	< 2.5
2	Bottom	< 2.5
3	Side A	< 2.5
4	Side B	0
5	Side C	0
6	Side D	< 2.5

Highest 1 meter dose rate	Bkg	mR/hr
Highest contact dose rate	0.06	mR/hr
Highest smear result	< 2.5	DPM/100 cm ²

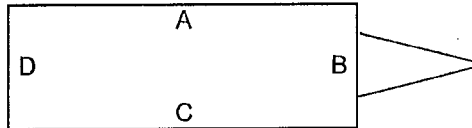
Approved for Shipment by: <u>Glen Huber</u> <div style="text-align: center; font-size: small;">HP Technician</div>	Date: <u>10/31/07</u>
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Container Shipping Survey Form

Project ID: DuSable Park

Date: 10/31/07	Survey #: DP004	Technician Name: Glen Huber	
Container Number: BKRU Ø12688	Alpha Inst. Ludlum Model 2200 S/N 102770 w/ Model 43-10 Detector	BKG 0.34 µR/hr	Beta/Gamma Inst. Ludlum Model 3 S/N 110805 w/ Model 44-38 Energy Comp G-M Probe
			BKG 0.02 µR/hr

Shipping Container



Gamma Readings

Highest Contact Reading on Each Side		
Side A	0.05	mRem/hr
Side B	0.02	mRem/hr
Side C	0.05	mRem/hr
Side D	0.03	mRem/hr
Average	0.0375	mRem/hr

Surface Contamination

Smear #	Location	DPM/100 cm ²
1	Top	0
2	Bottom	0
3	Side A	0
4	Side B	< 2.5
5	Side C	< 2.5
6	Side D	0

Highest 1 meter dose rate	Bkg	mR/hr
Highest contact dose rate	0.05	mR/hr
Highest smear result	< 2.5	DPM/100 cm ²

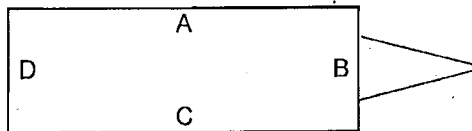
Approved for Shipment by: <u>[Signature]</u> HP Technician	Date: 10/31/07
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Container Shipping Survey Form

Project ID: DuSable Park

Date: 10/31/07	Survey #: DP005	Technician Name: Glen Hader	
Container Number: BKRU 012694	Alpha Inst. Ludlum Model 2200 S/N 102770 w/ Model 43-10 Detector	BKG 0.3cpm	Beta/Gamma Inst. Ludlum Model 3 S/N 110805 w/ Model 44-38 Energy Comp G-M Probe
			BKG 0.02 mR/hr

Shipping Container



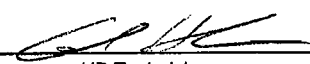
Gamma Readings

Highest Contact Reading on Each Side		
Side A	0.06	mRem/hr
Side B	0.04	mRem/hr
Side C	0.18	mRem/hr
Side D	0.04	mRem/hr
Average	0.08	mRem/hr

Surface Contamination

Smear #	Location	DPM/100 cm ²
1	Top	< 2.5
2	Bottom	0
3	Side A	< 2.5
4	Side B	0
5	Side C	< 2.5
6	Side D	< 2.5

Highest 1 meter dose rate	0.18	mR/hr
Highest contact dose rate	0.18	mR/hr
Highest smear result	< 2.5	DPM/100 cm ²

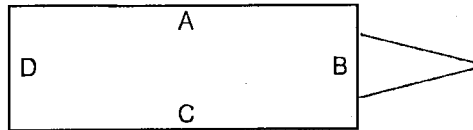
Approved for Shipment by:  HP Technician	Date: 10/31/07
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Container Shipping Survey Form

Project ID: DuSable Park

Date: 10/31/07	Survey #: DP006	Technician Name: Glenn Huber		
Container Number: Alpha Inst.	BKG	Beta/Gamma Inst.	BKG	
BKRU	Ludlum Model 2200 S/N 102770	Ludlum Model 3 S/N 110805	0.02	
026258	w/ Model 43-10 Detector	w/ Model 44-38 Energy Comp G-M Probe	~R/L	

Shipping Container



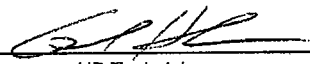
Gamma Readings

Highest Contact Reading on Each Side		
Side A	0.7	mRem/hr
Side B	0.06	mRem/hr
Side C	0.18	mRem/hr
Side D	0.08	mRem/hr
Average	0.255	mRem/hr

Surface Contamination

Smear #	Location	DPM/100 cm ²
1	Top	0
2	Bottom	< 0.5
3	Side A	< 0.5
4	Side B	< 0.5
5	Side C	< 0.5
6	Side D	0

Highest 1 meter dose rate	BR2	mR/hr
Highest contact dose rate	0.7	mR/hr
Highest smear result	< 0.5	DPM/100 cm ²

Approved for Shipment by: 	Date: 10/31/07
HP Technician	

Form 540 (3-84) EnergySolutions

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

SHIPPING PAPER

1. EMERGENCY TELEPHONE NUMBER (Include Area Code)
In Case of Emergency Call CHEMTREC 1-800-424-9300

ORGANIZATION
Tronox LLC

2. IS THIS AN "EXCLUSIVE USE" SHIPMENT?
☒ YES ☐ NO

3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST ☒ 1

4. DOES EPA REGULATE WASTE REQUIRING A MANIFEST ACCOMPANY THIS SHIPMENT?
☐ YES ☒ NO

5. SHIPPER - NAME AND FACILITY
Formerly - Kerr-McGee Chemical LLC
800 Weyrauch Street
West Chicago, IL 60185

SHIPPER I.D. NUMBER
0659

8. MANIFEST NUMBER
(Use this number on all continuation pages)
0659-02- 0686

6. CARRIER - Name and Address
Mark Kippel
R & R Trucking, Inc.
302 Thunder Road
Duenweg, MO 64841

9. CONSIGNEE - Name and Facility Address
Energy Solutions
Ciba Disposal Site
Interstate 80 Exit 49
Ciba, UT 84029

7. NRC FORM 540 AND 540A
NRC FORM 541 AND 541A
NRC FORM 542 AND 542A
Not Used

10. CERTIFICATION
This is to certify that the herein-named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. This also certifies that the materials are classified, packaged, and labeled and are in proper condition for transportation and disposal as described in accordance with the requirements of 19 CFR Parts 20 and 31, or equivalent state regulations.

11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION
(Including proper shipping name, hazard class, UN ID number, and any additional information)

12. DOT LABEL "RADIOACTIVE"

13. TRANSPORT INDEX

14. PHYSICAL AND CHEMICAL FORM

15. INDIVIDUAL RADIONUCLIDES

16. TOTAL PACKAGE ACTIVITY
MBq mCi

17. LSASCO CLASS

18. TOTAL WEIGHT OR VOLUME
(Use appropriate units)

19. IDENTIFICATION NUMBER OF PACKAGE

20. TERMS AND CONDITION
A. HAZARDOUS MATERIALS: Generator represents & warrants that Waste Material is (or) is not a hazardous waste as defined in 40 CFR 261. Where the material is a hazardous waste, this shipment is also accompanied by a separate and complete hazardous waste manifest, along with the appropriate land-disposal restriction codes and/or certification as required by 40 CFR 262.1
B. TITLE: Upon acceptance at the disposal site by EnergySolutions, and all appropriate regulatory authorities, title to the Waste Material which conforms to Generator's representation herein shall hereupon transfer from the Generator and be vested in EnergySolutions.
C. WASTE MATERIAL: Generator represents and warrants that all data set forth in this (UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST) are true and correct in all respects and in accordance with all applicable governmental laws, rules, regulations and EnergySolutions facility license conditions. Generator further warrants that the Waste Material is properly classified, packaged, labeled, and marked in accordance with the applicable regulations of the Department of Transportation and any governmental agency having jurisdiction over such matters.

FOR CONSIGNEE USE ONLY

Record Waste Description Inadequate
Contamination or Leakage Detected
Unexpected Exposure Rates Detected
Labels, Markings, etc. Inadequate
Container Integrity Inadequate
Other
No Violations Detected on this Shipment

Waybill# 0 Confirm # 0

FORM 540 (3-83)

FORM 641
(3-99)

Energy Solutions

UNIFORM LOW-LEVEL RADIOACTIVE
WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION

Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and
Disposal of Radioactive Waste

1. MANIFEST TOTALS

NUMBER OF PACKAGES DISPOSAL CONTAINERS	NET WASTE VOLUME	NET WASTE WEIGHT	SPECIAL NUCLEAR MATERIAL (grams)		TOTAL	
1	(G) 11.5 (kg) 25.8	14620	U-233	U-235	U-238	0.00E+00
			ACTIVITY (MBq)			
			C-14	Tr-99		
			0.00E+00	0.00E+00		
			0.00E+00	0.00E+00		
			0.00E+00	0.00E+00		

2. MANIFEST NUMBER

0659-02- 0886

3. PAGE 1 of 1

PAGE(S)

4. SHIPPER NAME

Trenox LLC, formerly Kerr-McGee Chemical LLC

800 Weyrauch Street

West Chicago, IL 60185

SHIPMENT ID NUMBER

0886

5. SPECIAL CONTAINER DESCRIPTION

CONTAINER IDENTIFICATION NUMBER GENERATOR ID NUMBERS	CONTAINER DESCRIPTION (See Note 1)	VOLUME (m ³) (ft ³)	WASTE CONTAINER WEIGHT (kg) (lbs)	SURFACE RADIATION LEVEL (mR/hr) (μR/hr)	CONTAMINATION REMARKS (mrem/hr) (μrem/hr)	16 SURFACE RADIATION LEVEL (mR/hr) (μR/hr)	17 SURFACE RADIATION LEVEL (mR/hr) (μR/hr)	18 SURFACE RADIATION LEVEL (mR/hr) (μR/hr)	19 SURFACE RADIATION LEVEL (mR/hr) (μR/hr)	20 SURFACE RADIATION LEVEL (mR/hr) (μR/hr)
BKRU012534	11B LINED	15.3 540	22119 24.38	0.0008 0.05	0.0008 0.05	0.0008 0.05	0.0008 0.05	0.0008 0.05	0.0008 0.05	0.0008 0.05

11. WASTE
CLASSIFI-
CATION

AS-CLASS A

Stable

N/A 1162

B-CLASS B

C-CLASS C

CLASS A

UNCLASSIFIED

12. WASTE
DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER

12.1	WASTE DESCRIPTION	12.2	APPROXIMATE WASTE VOLUMES IN CONTAINER (See Note 3)	12.3	SORBENT SOLIDIFICATION STABILIZATION MEDIA (See Note 3)	12.4	CHEMICAL FORM/ CHELATING AGENT	12.5	WEIGHT % CHELATING AGENT IP-0.1%	12.6	INDIVIDUAL RADIONUCLIDES, ACTIVITY (MBq), CONCENTRATION, AND CONTAINER TOTAL ACTIVITY	12.7	MBq	12.8	mCi
1	Thorium Oxide/NP	11.5 405	100							Th-232	2.40E+01	6.48E-01			
2										Ra-226	1.57E+01	2.93E-01			
3										Th-230	5.22E+00	9.72E-02			
4										U-nat	3.22E+01	6.00E-01			
5										Total	6.08E+01	1.64E+00			

13. WASTE
CLASSIFI-
CATION

AS-CLASS A

Stable

N/A 1162

B-CLASS B

C-CLASS C

CLASS A

UNCLASSIFIED

NOTE 1: Container Description Codes. For additional
waste receipt information in additional structural containers,
the numerical code must be followed by "Q01".

1. Waste Box or Crate	2. Drum	3. Intermediate Container	4. Intermediate Container	5. Intermediate Container	6. Intermediate Container	7. Intermediate Container	8. Intermediate Container	9. Intermediate Container	10. Intermediate Container	11. Intermediate Container	12. Intermediate Container	13. Intermediate Container	14. Intermediate Container	15. Intermediate Container	16. Intermediate Container	17. Intermediate Container	18. Intermediate Container	19. Intermediate Container	20. Intermediate Container
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NOTE 2: Waste Disposition Codes. (Choose up to three which pertain to the waste.)

21. Chemical	22. Chemical	23. Chemical	24. Chemical	25. Chemical	26. Chemical	27. Chemical	28. Chemical	29. Chemical	30. Chemical	31. Chemical	32. Chemical	33. Chemical	34. Chemical	35. Chemical	36. Chemical	37. Chemical	38. Chemical	39. Chemical	40. Chemical
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NOTE 3: Specific Waste Descriptions.
(Choose all that apply.)

41. Densified	42. Solid	43. Solid	44. Solid	45. Solid	46. Solid	47. Solid	48. Solid	49. Solid	50. Solid	51. Solid	52. Solid	53. Solid	54. Solid	55. Solid	56. Solid	57. Solid	58. Solid	59. Solid	60. Solid
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NOTE 4: Solidification/Stabilization Codes. (Choose up to three which pertain to the waste.)

61. Solidification	62. Solidification	63. Solidification	64. Solidification	65. Solidification	66. Solidification	67. Solidification	68. Solidification	69. Solidification	70. Solidification	71. Solidification	72. Solidification	73. Solidification	74. Solidification	75. Solidification	76. Solidification	77. Solidification	78. Solidification	79. Solidification	80. Solidification
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NOTE 5: Solidification/Stabilization Codes. (Choose up to three which pertain to the waste.)

81. Solidification	82. Solidification	83. Solidification	84. Solidification	85. Solidification	86. Solidification	87. Solidification	88. Solidification	89. Solidification	90. Solidification	91. Solidification	92. Solidification	93. Solidification	94. Solidification	95. Solidification	96. Solidification	97. Solidification	98. Solidification	99. Solidification	100. Solidification
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UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST SHIPPING PAPER In Case of Emergency Call CHEMTREC 1-800-424-9300		5. SHIPPER - NAME AND FACILITY Tronox LLC Formerly - Kerr-McGee Chemical LLC 800 Weyrauch Street West Chicago, IL 60185 UTAH PERMIT NUMBER: 0110 000 013 SHIPMENT NUMBER: 0487		SHIPPER I.D. NUMBER 0059 COLLECTOR PROCESSOR GENERATOR TYPE: Industrial X		7. NRC FORM 540 AND 540A NRC FORM 541 AND 541A NRC FORM 542 AND 542A ADDITIONAL INFORMATION Energy Solutions Clive Disposal Site Interstate 80, Exit 49 Clive, UT 84029 SIGNATURE - Authorized consignee acknowledging waste receipt		3. MANIFEST NUMBER (Use this number on all continuation pages) 0659-02- 0687 CONTACT Shipping and Receiving TELEPHONE NUMBER 435-884-0155 DATE 11/27/2007											
6. CARRIER - Name and Address Mark Kippel R & R Trucking, Inc. 302 Thunder Road Duquoin, MO 64841 CONTACT Mitch Lunsford		SHIPMENT INFORMATION EPA I.D. NUMBER: M0R000951973 SHIPPING DATE: 11/27/2007 TELEPHONE NUMBER: (Include Area Code) 855-252-2784		10. CERTIFICATION This is to certify that the herein-named materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. This also certifies that the materials are classified, packaged, and labeled and are in proper condition for transportation and disposal as described in accordance with the requirements of 10 CFR Parts 20 and 61, or equivalent state regulations.		11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information) Radioactive Material, Low Specific Activity (LSA-1), Class 7, UN2912 Do Not Dump Placarded		12. DOT LABEL - "RADIOACTIVE" NA 13. TRANSPORT INDEX NA 14. PHYSICAL AND CHEMICAL FORM Solid / Thorium Oxide 15. INDIVIDUAL RADIOCLASSES Th-232, Ra-226, Th-230, U-nat		16. TOTAL PACKAGE ACTIVITY MBS: 4.85E+01 MCI: 1.31E+00 17. LSA/SCO CLASS LSA-1 18. TOTAL WEIGHT OR VOLUME (Use appropriate units) 20.525 tons 405 m³		19. IDENTIFICATION NUMBER OF PACKAGE BKR0012625							
FOR CONSIGNEE USE ONLY Record Waste Description inadequate Contamination or Leakage Detected Unexpected Exposure Rates Detected Labels, Markings, etc. Inadequate Container Integrity Inadequate Other No Violations Detected on this Shipment										20. TERMS AND CONDITION A. HAZARDOUS MATERIALS: Generator represents & warrants that Waste Material is (or) is not a hazardous waste as defined in 40 CFR 261. Where the material is a hazardous waste, the shipment is also accompanied by a separate and complete hazardous waste manifest, along with the appropriate land-disposal restriction notice and/or certification as required by 40 CFR 266.1. B. TITLE: Upon acceptance at the disposal site by EnergySolutions, and all appropriate regulatory authorities, title to the Waste Material which conforms to Generator's representation herein shall thereupon transfer from the Generator and be vested in EnergySolutions. C. WASTE MATERIAL: Generator represents and warrants that all data set forth in this (UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST) are true and correct in accordance with all applicable governmental laws, rules, regulations and EnergySolutions' facility license. D. INDEMNIFICATION: Generator agrees to indemnify EnergySolutions, its officers, its employees and agents against all losses and liability whatsoever if such losses or liability results from the failure of the Waste Material to conform in all material respects to the data supplied on the (UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST) or if this shipment fails to meet the standards presented by the Department of Transportation or any governmental agency having jurisdiction over such materials.									

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Form 540 (3-98)
UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST
SHIPPER: NAME AND FACILITY
Tronox LLC
Formerly - KarmicOce Chemical LLC
800 Weyrauch Street
West Chicago, IL 60185
SHIPMENT NUMBER: 0688
SHIPPER I.D. NUMBER: 0659
7. NRC FORM 540 AND 540A
PAGE 1 OF 1 PAGES
8. MANIFEST NUMBER
0659-02- 0688
1. EMERGENCY TELEPHONE NUMBER
2. IS THIS AN "EXCLUSIVE USE" SHIPMENT?
3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST
4. DOES EPA REGULATED WASTE ACCOMPANY THIS SHIPMENT?
5. SHIPPER - NAME AND FACILITY
6. CARRIER - Name and Address
7. NRC FORM 540 AND 540A
8. MANIFEST NUMBER
9. CONSIGNEE - Name and Facility Address
10. CERTIFICATION
11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION
12. DOT LABEL "RADIOACTIVE"
13. TRANSPORT INDEX
14. PHYSICAL AND CHEMICAL FORM
15. INDIVIDUAL RADIONUCLIDES
16. TOTAL PACKAGE ACTIVITY
17. LSA/SCO CLASS
18. TOTAL WEIGHT OR VOLUME
19. IDENTIFICATION NUMBER OF PACKAGE
20. TERMS AND CONDITION
A. HAZARDOUS MATERIALS
B. TITLE: Upon acceptance at the disposal site by EnergySolutions, and all appropriate regulatory authorities, title to the Waste Material which conforms to Generator's representation herein shall incept on transfer from the Generator and be vested in EnergySolutions.
C. WASTE MATERIAL: Generator represents and warrants that all data set forth in this UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST are true and correct in all respects and in accordance with all applicable governmental laws, rules, regulations and EnergySolutions' facility license.
D. ACCEPTANCE: By signing this UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST, it affirms its acceptance and responsibility for the waste material and its liability for the waste material in conformity with all applicable laws, rules, regulations and EnergySolutions' facility license.
E. MATERIALS: The waste material is being transported in accordance with the UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST and the standards presented by the Department of Transportation or any governmental agency having jurisdiction over such matters.

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST																													
CONTAINER AND WASTE DESCRIPTION																													
Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and Disposal of Radioactive Waste																													
<div style="display: flex; justify-content: space-between;"> <div> FORM 541 (048) </div> <div> 2. MANIFEST NUMBER 0659-02 0688 </div> </div>																													
<div style="display: flex; justify-content: space-between;"> <div> 1. WASTE TOTALS </div> <div> 3. PAGE 1 of 1 </div> <div> 4. SHIPPER NAME Troxel LLC, formerly Kerr-McGee Chemical LLC 800 Weyrauch Street West Chicago, IL 60185 </div> </div>																													
<div style="display: flex; justify-content: space-between;"> <div> 5. SPECIAL NUCLEAR MATERIAL (SNM) <div style="display: flex;"> <div style="flex: 1;">U-233 0.00E+00</div> <div style="flex: 1;">U-235 0.00E+00</div> <div style="flex: 1;">Pu 0.00E+00</div> </div> </div> <div> 6. TOTAL 0.00E+00 </div> </div>																													
<div style="display: flex; justify-content: space-between;"> <div> 7. ACTIVITY (MCi) <div style="display: flex;"> <div style="flex: 1;">Th-232 0.00E+00</div> <div style="flex: 1;">Th-230 0.00E+00</div> <div style="flex: 1;">U-nat 0.00E+00</div> </div> </div> <div> 8. SOURCE <div style="display: flex;"> <div style="flex: 1;">(MCi) 0.00E+00</div> <div style="flex: 1;">(Bq) 5.00E+00</div> </div> </div> </div>																													
<div style="display: flex; justify-content: space-between;"> <div> 9. DISPOSITION CONTAINER DESCRIPTION BKR0012688 LINED </div> <div> 10. SURFACE CONTAMINATION <div style="display: flex;"> <div style="flex: 1;">SURFACE RADIATION LEVEL (mSv/hr) 0.0004</div> <div style="flex: 1;">ALPHA (dpm/100cm²) 0.04</div> <div style="flex: 1;">BETA-GAMMA (dpm/100cm²) 3.35E-03</div> </div> </div> <div> 11. WASTE CONTAINER WEIGHT (kg) 22.29 (lbs) 49.3 </div> </div>																													
<div style="display: flex; justify-content: space-between;"> <div> 12. APPROXIMATE WASTE VOLUME(S) IN CONTAINER (See Note 2) (m³) 11.5 (ft³) 405 </div> <div> 13. SORBENT SOLIDIFICATION STABILIZATION MEDIA (See Note 3) NP </div> </div>																													
<div style="display: flex; justify-content: space-between;"> <div> 14. CHEMICAL DESCRIPTION Thorium Oxide/NP </div> <div> 15. RADIOLOGICAL DESCRIPTION <div style="display: flex;"> <div style="flex: 1;">INDIVIDUAL RADIONUCLIDES, ACTIVITY (MBq), CONCENTRATION, AND CONTAINER TOTAL ACTIVITY</div> <div style="flex: 1;"> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Radionuclide</th> <th>Activity (MBq)</th> <th>Concentration (Bq/g)</th> <th>Container Total Activity (MBq)</th> </tr> </thead> <tbody> <tr> <td>Th-232</td> <td>1.92E+01</td> <td>2.76E+01</td> <td>5.18E+01</td> </tr> <tr> <td>Th-230</td> <td>2.35E+01</td> <td>1.26E+01</td> <td>2.35E+01</td> </tr> <tr> <td>U-nat</td> <td>1.78E+01</td> <td>2.59E+01</td> <td>4.80E+01</td> </tr> <tr> <td>Total</td> <td>4.85E+01</td> <td></td> <td>1.37E+00</td> </tr> </tbody> </table> </div> </div> </div> </div>										Radionuclide	Activity (MBq)	Concentration (Bq/g)	Container Total Activity (MBq)	Th-232	1.92E+01	2.76E+01	5.18E+01	Th-230	2.35E+01	1.26E+01	2.35E+01	U-nat	1.78E+01	2.59E+01	4.80E+01	Total	4.85E+01		1.37E+00
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Total	4.85E+01		1.37E+00																										
<div style="display: flex; justify-content: space-between;"> <div> 16. WASTE CLASSIFICATION AS-Class A Solid NA 11e2 B-Class B C-Class C Class A Unstable </div> </div>																													

NOTE 1: Container Description Codes. For uniform waste manifesting disposal, approved minimum waste package (MWP) codes must be shown by "Q" or "P".

1. Aqueous Box or Can
2. Metal Box
3. Plastic Drum or Barrel
4. Metal Drum or Barrel
5. Metal Tank or Tank
6. Composite Tank or Tank
7. Polyethylene Tank or Tank
8. Shipping Box or Unit

9. Drum
10. Gas Cylinder
11. Bulk Unpackaged Waste
12. Unpackaged Compressed Gas
13. High Integrity Container
14. Other
15. Other

NOTE 2: Waste Description Codes. (Choose as few which best describe the waste.)

20. Chemical
21. Inorganic Ash
22. Soil
23. Gas
24. Oil
25. Aqueous Liquid
26. Organic Liquid (except flammable liquids)
27. Nonhazardous Flow
28. Organic Residue/Solids/Concentrations
29. Comminuted Trash
30. Noncombustible Trash
31. Animal Carcass
32. Biological Material (except Animal Carcass)
33. Comminuted Solid
34. Organic Solid (except Animal Carcass)
35. Unhazardous Flow
36. Solid Waste/Sludge
37. Paint or Putty

NOTE 3: Container Description Codes. For uniform waste manifesting disposal, approved minimum waste package (MWP) codes must be shown by "Q" or "P".

1. Aqueous Box or Can
2. Metal Box
3. Plastic Drum or Barrel
4. Metal Drum or Barrel
5. Metal Tank or Tank
6. Composite Tank or Tank
7. Polyethylene Tank or Tank
8. Shipping Box or Unit

9. Drum
10. Gas Cylinder
11. Bulk Unpackaged Waste
12. Unpackaged Compressed Gas
13. High Integrity Container
14. Other
15. Other

NOTE 4: Waste Description Codes. (Choose as few which best describe the waste.)

20. Chemical
21. Inorganic Ash
22. Soil
23. Gas
24. Oil
25. Aqueous Liquid
26. Organic Liquid (except flammable liquids)
27. Nonhazardous Flow
28. Organic Residue/Solids/Concentrations
29. Comminuted Trash
30. Noncombustible Trash
31. Animal Carcass
32. Biological Material (except Animal Carcass)
33. Comminuted Solid
34. Organic Solid (except Animal Carcass)
35. Unhazardous Flow
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NOTE 5: Container Description Codes. For uniform waste manifesting disposal, approved minimum waste package (MWP) codes must be shown by "Q" or "P".

1. Aqueous Box or Can
2. Metal Box
3. Plastic Drum or Barrel
4. Metal Drum or Barrel
5. Metal Tank or Tank
6. Composite Tank or Tank
7. Polyethylene Tank or Tank
8. Shipping Box or Unit

9. Drum
10. Gas Cylinder
11. Bulk Unpackaged Waste
12. Unpackaged Compressed Gas
13. High Integrity Container
14. Other
15. Other

NOTE 6: Waste Description Codes. (Choose as few which best describe the waste.)

20. Chemical
21. Inorganic Ash
22. Soil
23. Gas
24. Oil
25. Aqueous Liquid
26. Organic Liquid (except flammable liquids)
27. Nonhazardous Flow
28. Organic Residue/Solids/Concentrations
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31. Animal Carcass
32. Biological Material (except Animal Carcass)
33. Comminuted Solid
34. Organic Solid (except Animal Carcass)
35. Unhazardous Flow
36. Solid Waste/Sludge
37. Paint or Putty

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FORM 541
(3-88)

Energy Solutions

UNIFORM LOW-LEVEL RADIOACTIVE
WASTE MANIFEST
CONTAINER AND WASTE DESCRIPTION

Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and
Disposal of Radioactive Waste

1. WASTE TOTALS

2. MANIFEST NUMBER
0659-02 0650

3. PAGE 1 of 1

PAGE(S)

4. SHIPPER NAME
Troxor LLC, formerly Kerr-McGee Chemical LLC
800 Weyrauch Street
West Chicago, IL 60185

5. SHIPMENT ID NUMBER
0650

6. CONTAINER IDENTIFICATION NUMBER
EKR0026258

7. CONTAINER DESCRIPTION
(See States 1)

8. WASTE AND CONTAINER WEIGHT
(lb) (kg)

9. SURFACE RADIATION LEVEL
(mSv/hr) (μR/hr)

10. WASTE DESCRIPTION
(See States 2)

11. WASTE VOLUME
(lit) (ft³)

12. WASTE VOLUME
(lit) (ft³)

13. WASTE VOLUME
(lit) (ft³)

14. WASTE VOLUME
(lit) (ft³)

15. WASTE VOLUME
(lit) (ft³)

16. WASTE CLASSIFICATION

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100. WASTE CLASSIFICATION

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST				SHIPPING PAPER		SHIPPER - NAME AND FACILITY		SHIPPER ID NUMBER		7. NRC FORM 540 AND 540A NRC FORM 541 AND 541A NRC FORM 542 AND 542A ADDITIONAL INFORMATION		3. MANIFEST NUMBER (Use this number on all continuation pages)					
1. EMERGENCY TELEPHONE NUMBER (Include Area Code) In Case of Emergency Call CHEMTREC 1-800-424-9300 ORGANIZATION Tironox LLC				2. IS THIS AN "EXCLUSIVE USE" SHIPMENT? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST 1		4. DOES EPA REGULATE THIS WASTE REQUIRING A HAZARDOUS WASTE MANIFEST ACCORDING TO THIS SHIPMENT? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		5. SHIPPER - NAME AND FACILITY Tironox LLC Formety - Kerr-McGee Chemical LLC 800 Weyrauch Street West Chicago, IL 60185		SHIPPER ID NUMBER 0659		7. NRC FORM 540 AND 540A NRC FORM 541 AND 541A NRC FORM 542 AND 542A ADDITIONAL INFORMATION		3. MANIFEST NUMBER (Use this number on all continuation pages) 0659-02- 0691	
1. EMERGENCY TELEPHONE NUMBER (Include Area Code) In Case of Emergency Call CHEMTREC 1-800-424-9300 ORGANIZATION Tironox LLC				2. IS THIS AN "EXCLUSIVE USE" SHIPMENT? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		3. TOTAL NUMBER OF PACKAGES IDENTIFIED ON THIS MANIFEST 1		4. DOES EPA REGULATE THIS WASTE REQUIRING A HAZARDOUS WASTE MANIFEST ACCORDING TO THIS SHIPMENT? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		5. SHIPPER - NAME AND FACILITY Tironox LLC Formety - Kerr-McGee Chemical LLC 800 Weyrauch Street West Chicago, IL 60185		SHIPPER ID NUMBER 0659		7. NRC FORM 540 AND 540A NRC FORM 541 AND 541A NRC FORM 542 AND 542A ADDITIONAL INFORMATION		3. MANIFEST NUMBER (Use this number on all continuation pages) 0659-02- 0691	
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FORM 541
(0-80)

Energy/Solidified

UNIFORM LOW-LEVEL RADIOACTIVE
WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION

Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and
Disposal of Radioactive Waste

1. CONTAINER IDENTIFICATION NUMBER/GENERATOR ID NUMBER

2. CONTAINER DESCRIPTION (See Note 1)

3. WASTE AND CONTAINER WEIGHT (kg) (lb)

4. SURFACE RADIATION LEVEL (mSv/hr) (mR/hr)

5. SURFACE CONTAMINATION (dpm/100cm²) (dpm/100cm²)

6. DISPOSITION/CONTAINER DESCRIPTION

7. VOLUME (m³) (ft³)

8. WASTE AND CONTAINER WEIGHT (kg) (lb)

9. WASTE AND CONTAINER WEIGHT (kg) (lb)

10. SURFACE RADIATION LEVEL (mSv/hr) (mR/hr)

11. SURFACE CONTAMINATION (dpm/100cm²) (dpm/100cm²)

12. WASTE AND CONTAINER WEIGHT (kg) (lb)

13. WASTE AND CONTAINER WEIGHT (kg) (lb)

14. SURFACE RADIATION LEVEL (mSv/hr) (mR/hr)

15. SURFACE CONTAMINATION (dpm/100cm²) (dpm/100cm²)

16. SURFACE RADIATION LEVEL (mSv/hr) (mR/hr)

17. SURFACE CONTAMINATION (dpm/100cm²) (dpm/100cm²)

18. WASTE CLASSIFICATION

19. WASTE CLASSIFICATION

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Appendix C

Training Signature Sheet

Training Attendance Sheet

Title: Basic Radiation Safety

Date: 6/4/2012

Instructor: BRIAN SCHMIDT

Format: Lecture

[illegible]

Appendix D

Radiological Soil Sample Analyses

D-1 Gamma Spectroscopy

D-2 NUTRANL Analyses

**D-3 USEPA Contract Laboratory
results**

Appendix D-1

Gamma Spectroscopy



6312 West Oakton Street
Morton Grove, IL 60053-2723
847-965-1999
Fax 847-965-1991

June 18, 2012

Steve Kornder, PHD
750 Corporate Woods Parkway
Vernon Hills, IL 60061
United States

RE: AECOM B3-HS1 SAMPLE

Dear Dr. Kornder:

Gamma spectroscopy analysis report for the above referenced samples, received on June 14th, 2012, are attached. The radionuclides of interest, Radium 228 (Ra-228), Thorium 232 (Th-232), Ra-226, and Th-230 are difficult to identify and quantify directly with reasonable counting intervals.

Ra-228 from the thorium series emits no significant photons. Th-232 from the thorium series emits photons with very low abundances. Ra-226 from the uranium series has only one significant photon at 186.21 keV and its abundance is slightly greater than 0.03. Analysis for Ra-226 using this energy is difficult because of the possible presence of U-235 which has an interfering 185.72 keV photon with a 0.54 abundance. Pa-234 also emits an interfering 186.0 keV photon. Th-230 from the uranium series has no significant photons. These properties make direct identification of the above radionuclides unlikely in practical situations.

The concentrations of surrogates with more abundant high energy photons usually represent the concentration of Ra-228, Th-232, Ra-226, and Th-230. Ac-228, in the thorium series, may be used as a surrogate for Ra-228 and Th-232. Bismuth 214 (Bi-214) in the uranium series, may be used as a surrogate for Ra-226 and Th-230.

The successful use of surrogates depends upon the radionuclides in each series being in equilibrium. In the thorium series, Ac-228 usually is in equilibrium with Ra-228 and Th-232 when

Steve Kornder
June 18, 2012
Page 2

RSSI

collected. The equilibrium in the uranium series, between Ra-226 and its surrogates, may be disturbed when samples are collected. Rn-222, a gas, can be released. Pb-214 and Bi-214 return to equilibrium with Ra-226 in a sample after an ingrowth period. The disequilibrium caused by the release of Rn-222 is minimized in heavy wet soils and may be disregarded when past analyses demonstrated that equilibrium was not disturbed. The equilibrium factor between Th-230 and Ra-226 must be known to use the concentration of Bi-214 as a surrogate for Th-230.

We will ship both samples received to the EPA as requested.

Please call me at 847-965-1999 if you have any questions.

Sincerely,

A handwritten signature in dark ink, appearing to read "Jeremy Kieser". The signature is fluid and cursive, with the first name "Jeremy" and last name "Kieser" clearly distinguishable.

Jeremy Kieser

attachment

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
RSSI Spectrum name: G120245.An1

Sample description
G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity uCi/g	Uncertainty Counting	1 Sigma Total
K-40	5.56E-06	3.74E+01%	3.74E+01%
PB-214 #	4.99E-06	1.87E+01%	1.89E+01%
PB-212	5.34E-04	1.95E-01%	3.35E+00%
TH-234	2.67E-05	7.86E+01%	7.87E+01%
AC-228	7.61E-04	4.09E-01%	2.34E+00%
Pa-234m	7.91E-05	2.31E+01%	2.32E+01%
BI-214	2.13E-06	2.19E+01%	2.20E+01%

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----- S U M M A R Y -----
Total Activity (1875.9 to 1902.2 keV) 1.41E-03 uCi/g

This section based on library: West Chicago.Lib

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
 RSSI Spectrum name: G120245.An1

Sample description
 G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity uCi/g	Energy keV	Activity uCi/g	Peak Code	MDA Value uCi/g	COMMENTS
---------------------	------	------------------------------	---------------	-------------------	--------------	--------------------	----------

K-40	N	5.56E-06	1460.82	5.56E-06	(P	2.08E-06	2.17E+01 G
			1 of	1 peaks	found		

PB-214	N	4.99E-06	351.93	4.99E-06	@(P	4.72E-07	1.83E+01 G
			1 of	2 peaks	found		

PB-212	N	5.34E-04	238.63	5.34E-04	(P	7.13E-07	1.95E-01 G
			1 of	1 peaks	found		

TH-234	N	2.67E-05	63.29	2.67E-05	&(P	1.52E-05	7.73E+01 G
			92.80	2.67E-05	} P	1.44E-05	7.86E+01 G
			2 of	2 peaks	found		

AC-228	N	7.61E-04	911.20	7.61E-04	@(P	1.18E-06	4.09E-01 G
			968.97	6.76E-04	- P	4.21E-06	4.84E-01 G
			338.32	6.64E-04	- P	3.41E-06	6.17E-01 G
			463.00	5.22E-04	- P	6.41E-06	1.06E+00 G
			209.28	5.00E-04	-	5.85E-06	1.83E+00 G
			93.35	1.17E-04	}	8.30E-06	5.13E+00 G
			6 of	6 peaks	found		

Pa-234m	N	7.91E-05	1001.03	7.91E-05	(P	1.79E-05	2.26E+01 G
			1 of	1 peaks	found		

BI-214	N	2.13E-06	609.32	2.13E-06	(P	4.62E-07	2.05E+01 G
			1764.49	5.80E-06	+ P	1.24E-06	3.17E+01 G
			1120.29	1.18E-05	+ P	1.30E-06	1.72E+01 G
			3 of	4 peaks	found		

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.

% - Peak fails sensitivity test.

\$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
RSSI Spectrum name: G120245.An1

Sample description
G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

- - - - -
This section based on library: West Chicago.Lib

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
 RSSI Spectrum name: G120245.An1

Sample description
 G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

***** U N I D E N T I F I E D P E A K S U M M A R Y *****									
Peak Centroid	Background	Net Area	Intensity	Uncert	FWHM	Suspected			
Channel	Energy	Counts	Counts	Cts/Sec	1 Sigma %	keV	Nuclide		
140.66	38.60	49110.	26349.	7.319	1.69	1.581	-	s	
200.98	52.63	26716.	370.	0.103	60.67	0.311	-	sc	
292.85	74.07	172352.	74122.	20.589	0.87	1.524	-	D	
303.68	76.59	156496.	107595.	29.888	0.60	1.526	-	D	
335.65	84.06	119818.	19923.	5.534	2.56	1.532	-	D	
347.53	86.82	125840.	55034.	15.287	1.01	1.534	-	D	
358.64	89.41	122291.	51690.	14.358	1.05	1.536	-	D	
372.73	92.59	149605.	45249.	12.569	1.30	1.539	-	D	
400.16	98.98	83527.	9640.	2.678	6.20	1.706	-	M	
425.28	104.70	97001.	21257.	5.905	2.18	1.549	-	D	
440.73	108.30	96563.	6956.	1.932	6.43	1.551	-	D	
467.62	114.67	100935.	6281.	1.745	10.04	1.616	-	s	
527.01	128.49	150674.	29768.	8.269	3.79	1.648	-	s	
599.98	145.47	114086.	3281.	0.911	20.98	1.550	-		
635.02	153.62	124918.	11862.	3.295	8.61	1.682	-	s	
687.32	165.79	88485.	1566.	0.435	36.88	0.791	-	s	
828.74	198.70	97322.	6108.	1.697	14.05	1.919	-	s	
901.20	215.56	96394.	3614.	1.004	20.22	1.677	-	M	
1005.00	239.71	129918.	85370.	23.714	0.69	1.651	-	D	
1009.77	240.82	356903.	35863.	9.962	2.41	1.655	-	D	
1087.87	259.08	28217.	525.	0.146	45.50	1.669	-	D	
1105.21	263.11	40240.	783.	0.218	36.41	1.672	-	D	
1133.86	269.65	48576.	33533.	9.315	1.08	1.677	-	D	
1151.25	273.70	48179.	1138.	0.316	27.43	1.680	-	D	
1165.09	276.92	43803.	21545.	5.985	1.53	1.683	-	D	
1210.83	287.61	39634.	4235.	1.176	8.68	1.614	-		
1262.24	299.58	49280.	35912.	9.976	1.88	1.859	-	SM	
1381.49	327.33	49283.	27795.	7.721	1.82	1.814	-		
1400.65	331.79	27105.	1390.	0.386	18.92	1.031	-	sD	
1467.73	347.40	21665.	297.	0.083	87.74	0.434	-	sc	
1731.64	408.82	35651.	15875.	4.410	2.81	1.852	-	s	
1831.97	432.17	20045.	742.	0.206	37.13	0.247	-	s	
1882.44	443.92	17120.	434.	0.120	55.63	0.644	-	s	
1917.77	452.14	21648.	2669.	0.742	12.27	1.388	-	s	
1969.00	464.06	30028.	4790.	1.331	5.32	1.823	-	D	
2029.59	478.17	23430.	1202.	0.334	30.46	1.140	-	s	
2054.00	483.85	17743.	496.	0.138	48.25	0.289	-	s	
2077.14	489.23	12935.	287.	0.080	56.33	1.845	-	D	
2089.56	492.12	19531.	483.	0.134	41.14	1.847	-	D	
2134.37	502.55	15467.	1290.	0.358	19.49	1.133	-	s	
2166.56	510.04	41821.	59049.	16.403	0.92	2.089	-	s	
2266.63	533.34	17472.	535.	0.149	54.52	0.308	-	s	
2319.68	545.58	19051.	1376.	0.382	14.44	1.888	-	D	
2335.48	549.26	19965.	1150.	0.320	17.62	1.891	-	D	
2389.07	561.84	26106.	5698.	1.583	6.56	1.799	-	s	
2427.91	570.88	22213.	2521.	0.700	16.31	0.670	-	s	
2477.97	582.53	43704.	188480.	52.356	0.40	2.039	-	s	
2587.77	608.09	18554.	467.	0.130	41.52	1.935	-	D	
2637.78	619.73	13484.	450.	0.125	44.94	1.233	-	s	
2959.04	694.52	12454.	594.	0.165	38.54	0.415	-	s	
2998.85	703.71	10834.	380.	0.106	39.03	2.007	-	D	
3013.43	707.11	17759.	1275.	0.354	15.05	2.009	-	D	

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
 RSSI Spectrum name: G120245.An1

Sample description
 G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

3097.22	726.69	30252.	42096.	11.693	1.61	2.092	-	s
3216.66	754.49	18893.	5650.	1.570	6.57	2.192	-	s
3252.18	762.81	12911.	3019.	0.839	5.63	2.050	-	D
3290.64	771.71	16437.	7914.	2.198	4.00	2.136	-	
3333.42	781.74	13444.	2448.	0.680	7.00	2.064	-	D
3347.73	785.07	12962.	4931.	1.370	3.56	2.067	-	D
3387.72	794.32	16494.	21764.	6.046	1.66	2.163	-	s
3540.50	829.89	8699.	2218.	0.616	8.36	2.183	-	D
3560.00	834.43	12101.	1095.	0.304	14.53	2.103	-	D
3563.85	835.69	9158.	7519.	2.089	2.14	2.104	-	D
3582.27	839.98	8410.	4272.	1.187	3.40	2.107	-	D
3620.49	848.51	7494.	517.	0.144	41.25	0.677	-	s
3669.85	860.00	13804.	22048.	6.124	2.09	2.169	-	s
3810.21	892.68	6594.	1697.	0.471	10.30	1.139	-	s
3857.80	903.77	10577.	1499.	0.416	14.38	1.733	-	sD
4089.71	957.77	7016.	881.	0.245	22.20	0.953	-	sD
4117.90	964.33	25589.	24006.	6.668	1.14	2.198	-	D
4145.00	970.64	11715.	3890.	1.080	4.25	2.199	-	D
4220.50	988.22	5003.	1128.	0.313	17.25	1.327	-	s
4286.48	1003.23	4018.	573.	0.159	16.21	2.227	-	D
4548.70	1064.60	4114.	1176.	0.327	8.25	2.271	-	D
4606.09	1078.01	3984.	2557.	0.710	8.05	2.349	-	s
4673.42	1093.69	4666.	2832.	0.787	5.81	2.369	-	s
4899.88	1146.43	1553.	353.	0.098	26.10	0.760	-	sM
5085.01	1189.55	917.	255.	0.071	23.80	0.915	-	sM
5315.60	1242.85	4588.	430.	0.120	22.77	2.399	-	D
5328.47	1245.85	4151.	1769.	0.491	5.67	2.401	-	D
5342.79	1249.19	4451.	256.	0.071	37.32	2.403	-	D
5452.03	1275.03	2050.	358.	0.100	32.64	0.427	-	s
5625.42	1315.52	2243.	180.	0.050	37.94	2.450	-	D
5731.23	1340.06	1834.	122.	0.034	58.53	0.270	-	s
5829.58	1362.97	1518.	118.	0.033	56.49	0.418	-	s
5933.02	1387.07	1619.	166.	0.046	44.33	0.512	-	s
5991.77	1400.75	2774.	234.	0.065	49.49	0.437	-	s
6038.91	1411.73	1098.	88.	0.025	67.49	0.287	-	s
6123.12	1431.35	3311.	370.	0.103	37.66	0.757	-	s
6191.90	1447.37	1190.	249.	0.069	32.37	0.533	-	s
6239.90	1458.47	2862.	2666.	0.740	3.44	2.550	-	D
6246.00	1459.98	3240.	117.	0.033	69.37	2.548	-	c
6361.67	1486.92	1157.	101.	0.028	55.10	0.565	-	s
6398.56	1495.43	2709.	2777.	0.771	3.26	2.576	-	D
6423.70	1501.29	2710.	1477.	0.410	5.62	2.580	-	D
6471.30	1512.46	2774.	1304.	0.362	10.56	2.406	-	
6552.53	1531.39	500.	49.	0.014	62.87	0.327	-	c
6760.80	1579.91	2970.	1802.	0.501	8.34	2.185	-	D
6794.70	1588.07	6061.	10080.	2.800	1.48	2.639	-	D
6813.87	1592.53	6934.	5360.	1.489	2.59	2.642	-	D
6935.08	1620.64	3144.	4847.	1.346	2.18	2.662	-	D
6953.54	1624.94	5359.	1145.	0.318	9.51	2.665	-	D
6976.83	1630.37	2669.	5228.	1.452	1.97	2.668	-	D
7009.23	1637.79	3136.	1413.	0.393	14.26	2.609	-	
7071.92	1652.40	1548.	542.	0.151	18.99	0.373	-	s
7130.67	1666.08	2808.	667.	0.185	23.03	2.051	-	s
7183.01	1678.27	2235.	382.	0.106	18.24	2.701	-	D
7248.33	1693.50	623.	49.	0.014	84.99	0.601	-	c
7281.98	1701.34	2156.	355.	0.099	30.40	0.617	-	s

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
RSSI Spectrum name: G120245.An1

Sample description
G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

7458.64	1742.50	1537.	171.	0.048	47.76	0.413	-	s
7605.23	1776.66	1989.	469.	0.130	25.29	0.280	-	s
7816.44	1825.88	527.	36.	0.010	91.54	0.534	-	sc
7910.00	1847.68	2065.	213.	0.059	43.65	0.533	-	s
8015.98	1872.38	1974.	791.	0.220	8.70	2.832	-	D
8031.04	1875.89	1074.	484.	0.135	10.59	2.834	-	D

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

This section based on library: West Chicago.Lib

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
RSSI Spectrum name: G120245.An1

Sample description
G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

Acquisition information

Start time: 14-Jun-2012 16:53:49
Live time: 3600
Real time: 3972
Dead time: 9.36 %
Detector ID: 1

Detector system

USER-802B915354 MCB 9

Calibration

Filename: G120245.An1
01-24-12 calibration

Energy Calibration

Created: 14-Jun-2012 16:52:35
Zero offset: 5.874 keV
Gain: 0.233 keV/channel
Quadratic: $2.434\text{E-}08 \text{ keV/channel}^2$

Efficiency Calibration

Created: 24-Jan-2012 10:40:57
Type: Polynomial
Uncertainty: 0.353 %
Coefficients: -0.140148 -4.969891 0.856404
-0.125295 0.007713 -0.000191

Library Files

Main analysis library: West Chicago.Lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.22
Start channel: 20 (10.53keV)
Stop channel: 8144 (1902.22keV)
Peak rejection level: 100.000%
Peak search sensitivity: 2
Sample Size: 3.5570E+02
Activity scaling factor: $1.0000\text{E+}00 / (1.0000\text{E+}00 * 3.5570\text{E+}02) = 2.8114\text{E-}03$
Detection limit method: Traditional ORTEC method
Random error: 1.0000000E+00
Systematic error: 1.0000000E+00
Fraction Limit: 10.000%
Background width: best method (based on spectrum).
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy: 0.000
Multiplet shift channel: 2.000

Corrections

	Status	Comments
Decay correct to date:	NO	

ORTEC g v - i (1215) Env32 G53W4.22 15-JUN-2012 09:49:30
RSSI Spectrum name: G120245.An1

Sample description
G120245 AECOM B3-HSI, 355.7g

Spectrum Filename: H:\GammaVision\User\Spectra\G120245.An1

Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	10_12_30 30%.Pbc
		30-Dec-2010 10:17:12
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc.	16	cutoff	20.00000	%
Energy Calibration				
Normalized diff:			0.2610	

Laboratory: RSSI

Appendix D-2

NUTRANL Analyses

Gamma Spec Report - AECOM DuSable Park June 2012

Stan A. Huber Consultants, Inc.
200 North Cedar Road
New Lenox, IL 60451
(800) 383-0468

Instrument ID:

Canberra Genie 2000 NaI Gamma Spec System
2"x2" NaI detector w/ pulse height analysis software package

Summary Report - Samples Collected on June 4, 2012 - June 12, 2012

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3739	6/4/2012	background	bkg060412	7.5	-0.5	4.25	0.22	1.32	-0.49	1.75	-0.27	2.19
3740	6/4/2012	soil standard	soilst060412	36.9	13.23	3.78	0.46	1.09	7.07	1.5	7.53	1.85
3741	6/4/2012	EPA QC Standard	RESL080905	18.79	28.68	10.56	8.46	2.95	12.05	3.96	20.51	4.94
3742	6/4/2012	EPA QC Standard	RESL081005	21.4	6.39	5.3	1.68	1.58	4.61	2.14	6.29	2.66
3743	6/4/2012	EPA QC Standard	RESL081105	16.58	39.69	26.47	29.02	7.49	33.32	9.8	62.34	12.33
3744	6/4/2012	DuSable Park	Bag #1	26.8	22.03	9.42	13.93	2.66	4.92	3.34	18.85	4.27
3745	6/4/2012	DuSable Park	Bag #2	26	13.89	7.04	10.28	2.02	3.52	2.58	13.8	3.28
3746	6/4/2012	DuSable Park	Bag #3	24.5	7.85	5.4	2.73	1.62	3.75	2.13	6.48	2.68
3747	6/4/2012	DuSable Park	Bag #4	25	16.36	8.02	11.62	2.27	7.07	2.94	18.69	3.71
3748	6/4/2012	DuSable Park	Bag #5	24.5	11.29	8.35	11.92	2.45	6.47	3.06	18.39	3.92
3749	6/4/2012	DuSable Park	Bag #6	23.5	1.08	7.89	12.53	2.35	-0.38	2.91	12.15	3.74
3750	6/4/2012	DuSable Park	Bag #7	24.4	8.26	7.25	6.6	2.1	0.46	2.6	7.06	3.34
3751	6/6/2012	background	bkg060612	7.5	8.87	3.31	-0.73	0.95	0.84	1.27	0.11	1.59
3752	6/6/2012	soil standard	soilst060612	36.9	6.78	5.68	2.8	1.7	5.48	2.25	8.28	2.82
3753	6/6/2012	DuSable Park	Bag #8	35.6	13.08	7.36	12.87	2.09	1.65	2.6	14.52	3.34
3754	6/6/2012	DuSable Park	Bag #9	36	9.51	8.35	7.66	2.46	1.41	3.04	9.07	3.91
3755	6/6/2012	DuSable Park	Bag #10	33.2	6.88	6.7	8.26	1.96	1.68	2.47	9.94	3.15
3756	6/6/2012	DuSable Park	Bag #11	36.2	9.4	5.18	5.67	1.5	6.09	1.99	11.76	2.49
3757	6/6/2012	DuSable Park	Bag #12	30.5	4.2	5.22	5.24	1.56	1.56	1.97	6.8	2.51
3758	6/6/2012	DuSable Park	Bag #13	32.3	10.93	7.6	3.51	2.17	6.01	2.89	9.52	3.61
3759	6/6/2012	DuSable Park	Bag #14	32	9.09	6.19	5.48	1.8	6.03	2.39	11.51	2.99
3760	6/6/2012	DuSable Park	Bag #15	30.7	6.54	8.27	4.68	2.4	1.49	3.03	6.17	3.87
3761	6/6/2012	DuSable Park	Bag #16	30.5	12.75	5.79	1.12	1.67	3.33	2.21	4.45	2.77
3762	6/10/2012	background	bkg061012	7.5	0.25	3.65	1.17	1.13	-1.04	1.43	0.13	1.82
3763	6/10/2012	soil standard	soilst061012	36.9	1.49	4.91	4.49	1.48	3.81	1.96	8.3	2.46
3764	6/10/2012	DuSable Park	Bag #17	29	0.67	4.37	5.52	1.33	4.59	1.75	10.11	2.20
3765	6/10/2012	DuSable Park	Bag #18	30.9	-0.25	4.23	9	1.29	3.19	1.65	12.19	2.09
3766	6/10/2012	DuSable Park	Bag #19	28.6	8.33	6.22	9.34	1.81	0.5	2.22	9.84	2.86
3767	6/10/2012	DuSable Park	Bag #20	31.3	0.28	6.84	6.04	2.09	1.38	2.62	7.42	3.35
3768	6/10/2012	DuSable Park	Bag #21	30.5	11.67	7.42	8.45	2.16	3.1	2.71	11.55	3.47
3769	6/10/2012	DuSable Park	Bag #22	30.1	4.21	6.31	7.5	1.86	4.43	2.44	11.93	3.07
3770	6/10/2012	DuSable Park	Bag #23	29.9	5.87	4.25	6.64	1.27	0.17	1.58	6.81	2.03
3771	6/10/2012	DuSable Park	Bag #24	31	7.43	4.41	1.54	1.3	3.86	1.72	5.4	2.16
3772	6/10/2012	DuSable Park	Bag #25	31.8	11.15	5.7	7.14	1.66	2.24	2.08	9.38	2.66
3774	6/11/2012	background	bkg061112	7.5	2.42	3.65	-0.14	1.12	0.35	1.5	0.21	1.87

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3776	6/11/2012	soil standard	soilstd061112	36.9	6.78	5.75	3.75	1.68	4.1	2.16	7.85	2.74
3777	6/11/2012	DuSable Park	Bag #27	34.4	8.44	7.46	3.88	2.16	4.67	2.92	8.55	3.63
3778	6/11/2012	DuSable Park	Bag #28	32.4	5.35	6.02	8.66	1.8	-0.74	2.14	7.92	2.80
3779	6/11/2012	DuSable Park	Bag #29	31	-4.76	6.71	7.64	2.08	2.73	2.63	10.37	3.35
3780	6/11/2012	DuSable Park	Bag #30	31.4	15.59	5.3	5.08	1.49	3.02	1.94	8.1	2.45
3781	6/11/2012	DuSable Park	Bag #31	31.6	1.49	5.56	11.07	1.66	3.55	2.15	14.62	2.72
3782	6/11/2012	DuSable Park	Bag #32	32.4	15.51	7.25	6.73	2.03	0.23	2.56	6.96	3.27
3783	6/12/2012	background	bkg061212	7.5	5.23	3.42	-0.15	1	0.17	1.36	0.02	1.69
3784	6/12/2012	soil standard	soilstd061212	36.9	13.4	6.26	4.99	1.82	2.25	2.32	7.24	2.95
3785	6/12/2012	DuSable Park	Bag #33	29.2	16.33	9.55	8.08	2.81	2.81	3.43	10.89	4.43
3786	6/12/2012	DuSable Park EPA	Area C EPA #1	25.8	5.13	6.08	3.63	1.77	0.6	2.36	4.23	2.95
3787	6/12/2012	DuSable Park EPA	Area C EPA #2	24.9	1.19	5.43	5.01	1.62	-0.26	2.06	4.75	2.62
3788	6/12/2012	DuSable Park EPA	Area C EPA #3	25.2	9.58	5.44	2.29	1.58	2.77	2.06	5.06	2.60
3789	6/12/2012	DuSable Park EPA	Area C EPA #4	26.1	4.02	4.17	3.78	1.25	2.06	1.61	5.84	2.04
3790	6/12/2012	DuSable Park EPA	Area C EPA #5	25.6	10.84	5.26	3.64	1.5	0.73	1.95	4.37	2.46
3791	6/12/2012	DuSable Park EPA	Area A EPA #1	31.8	5.32	5.46	3.73	1.59	-0.12	2	3.61	2.56
3792	6/12/2012	DuSable Park EPA	Area A EPA #2	32.6	7.71	3.92	2.21	1.16	3.75	1.52	5.96	1.91
3793	6/12/2012	DuSable Park EPA	Area A EPA #3	30.7	-0.74	7.18	3.72	2.19	1.02	2.84	4.74	3.59
3794	6/12/2012	DuSable Park EPA	Area A EPA #4	38.9	6.55	4.15	2.27	1.23	2.63	1.61	4.9	2.03
3795	6/12/2012	DuSable Park EPA	Area A EPA #5	39.2	12.72	4.69	1.68	1.35	3.47	1.77	5.15	2.23
3796	6/12/2012	DuSable Park EPA	Area B3 EPA #1	31.6	10.03	4.75	1.67	1.39	1.65	1.77	3.32	2.25
3797	6/12/2012	DuSable Park EPA	Area B3 EPA #2	30.1	6.04	4.42	0.71	1.3	1.85	1.73	2.56	2.16
3798	6/12/2012	DuSable Park EPA	Area B3 EPA #3	30.6	8.93	4.79	0.76	1.39	2.93	1.88	3.69	2.34
3799	6/12/2012	DuSable Park EPA	Area B3 EPA #4	31.2	7.55	5.35	0.42	1.57	1.81	2.04	2.23	2.57
3800	6/12/2012	DuSable Park EPA	Area B3 EPA #5	31.4	9.67	5.12	1.72	1.48	0.3	1.91	2.02	2.42
3801	6/12/2012	DuSable Park EPA	Area B2 EPA #1	30.6	7.8	4.63	-0.02	1.35	3.62	1.88	3.6	2.31
3802	6/12/2012	DuSable Park EPA	Area B2 EPA #2	30.6	8.71	6.08	1.75	1.73	1.85	2.33	3.6	2.90
3803	6/12/2012	DuSable Park EPA	Area B2 EPA #3	31.6	1.07	5.69	2.7	1.72	1.68	2.23	4.38	2.82
3804	6/12/2012	DuSable Park EPA	Area B2 EPA #4	31.6	4.65	4.74	0.9	1.42	2.84	1.9	3.74	2.37
3805	6/12/2012	DuSable Park EPA	Area B2 EPA #5	31.5	6.11	4.34	1.38	1.29	1.38	1.69	2.76	2.13
3806	6/12/2012	DuSable Park EPA	Area B1 EPA #1	30.5	-3.77	4.18	3.87	1.31	0.34	1.64	4.21	2.10
3807	6/12/2012	DuSable Park EPA	Area B1 EPA #2	30.1	2.2	4.65	1.14	1.41	2.61	1.93	3.75	2.39
3808	6/12/2012	DuSable Park EPA	Area B1 EPA #3	30.3	3.8	5.71	1.31	1.72	2.21	2.29	3.52	2.86
3809	6/12/2012	DuSable Park EPA	Area B1 EPA #4	30.4	6.19	3.31	1.23	0.97	2.31	1.35	3.54	1.66
3810	6/12/2012	DuSable Park EPA	Area B1 EPA #5	30.6	7.83	4.54	0.75	1.33	2.22	1.79	2.97	2.23
3811	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #1	30.1	9.24	5.56	0	1.61	3.43	2.17	3.43	2.70
3812	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #2	29.4	7.82	5.02	0.81	1.47	1.78	1.99	2.59	2.47
3813	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #3	30.1	6.67	5.68	2.87	1.63	0.35	2.15	3.22	2.70
3814	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #4	29.1	7.16	4.2	1.13	1.25	0.48	1.63	1.61	2.05
3815	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #5	30.4	8.83	5.21	-0.42	1.52	2.1	2.09	1.68	2.58

All results are in pCi/gram

** Important Note: System has not been calibrated for U-238 and the analytical results detailed above for U-238 should not be used or considered accurate

Appendix D-3

USEPA Contract Laboratory Results

Verification Samples



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR
National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

August 20, 2012

MEMORANDUM

SUBJECT: Radiochemical Results for
Dusable Park Samples

FROM: John G. Griggs, Acting Director *John Griggs*
Center for Environmental Radioanalytical Laboratory Science

TO: Eugene Jablonowski, Health Physicist
Region 5

Attached is a data package for gamma analysis of samples collected from the Dusable Park in Chicago, IL. The samples constitute NAREL batch number 1200027.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-7052.

Attachments

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
GAMMA ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1200027

Project: Region 5, Dusable Park, Chicago, IL
Analysis method: Gamma Spectrometry
Report ID: 1200027-GAMMA
Report type: Original
Date reported: 08/09/2012
Total pages in report: 16

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2.06522W	AREA C EPA#1-5	IL:CHICAGO	SOIL	06/12/2012	06/18/2012
B2.06523X	AREA A EPA#1-5	IL:CHICAGO	SOIL	06/12/2012	06/18/2012
B2.06524Y	AREA B3 EPA#1-5	IL:CHICAGO	SOIL	06/12/2012	06/18/2012
B2.06525Z	AREA B2 EPA#1-5	IL:CHICAGO	SOIL	06/12/2012	06/18/2012
B2.06526A	AREA B1 EPA#1-5	IL:CHICAGO	SOIL	06/12/2012	06/18/2012
B2.06527B	AREA D EPA#1-5	IL:CHICAGO	SOIL	06/12/2012	06/18/2012

EXCEPTIONS

1. **Packaging and shipping** – No problems were observed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – Received five 20-mL bottles of soil per sample which were composited into one container, sealed and held for 21 days to allow for ingrowth.
4. **Analysis** – No problems were encountered.
5. **Holding times** – No holding times were specified.

QUALITY CONTROL

1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

Mary Wisdom
Mary F. Wisdom
Quality Assurance Manager, NAREL

8-16-12
Date

John G. Griggs
John G. Griggs
Acting Director, Center for Environmental Radioanalytical
Laboratory Science

8/20/12
Date

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank
STD	External standard (used for ^{228}Ra yield determination)

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

RADIOCHEMICAL DATA

Radiochemical analyses usually require the subtraction of an instrument background measurement result from a gross sample measurement result. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical importance, as for example in the evaluation of trends or the comparison of two groups of samples.

To the extent practical, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the "2-sigma" measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The measurement result, uncertainty, and MDC are always expressed in the same unit of measurement.

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of method blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity, 2-sigma uncertainty, and a sample-specific estimate of the MDC for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected above background with the exception of client requested nuclides of interest. The activity for each of the requested nuclides is reported whether negative, positive, or zero along with the associated 2-sigma uncertainty and the sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for ^{214}Bi , ^{214}Pb , ^{234}Th , $^{234\text{m}}\text{Pa}$, ^{226}Ra , ^{231}Th , and ^{235}U are subject to greater uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma expanded uncertainty that is reported with each result. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between ^{226}Ra and ^{235}U , NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for ^{226}Ra activities can be obtained from the reported activities of its decay products, ^{214}Pb and ^{214}Bi , which are likely to be somewhat less than the ^{226}Ra activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as ^{131}I and ^{140}Ba , when there is a long delay between collection and analysis.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

ANALYSIS SUMMARY

Analysis method: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	Client Sample ID	QC Type	Date Completed	Preparation Batch #	Assay Batch #
B2.06522W	AREA C EPA#1-5	DUP	07/19/2012	0008916N	0016109V
B2.06522W	AREA C EPA#1-5		07/21/2012	0008916N	0016109V
B2.06523X	AREA A EPA#1-5		07/19/2012	0008916N	0016109V
B2.06524Y	AREA B3 EPA#1-5		07/20/2012	0008916N	0016109V
B2.06525Z	AREA B2 EPA#1-5		07/20/2012	0008916N	0016109V
B2.06526A	AREA B1 EPA#1-5		07/20/2012	0008916N	0016109V
B2.06527B	AREA D EPA#1-5		07/20/2012	0008916N	0016109V
LCS-00643066U *		LCS	07/20/2012	0008916N	0016109V
RBK-00643065T *		RBK	07/21/2012	0008916N	0016109V

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06522W	Amount analyzed:	1.210e+02 GDRY
Client sample ID:	AREA C EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 11:40 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	95.06 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/19/2012 11:40	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte		Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140		3.68e-03	4.3e-01	7.3e-01	PCI/GDRY	06/12/2012 11:40 CDT
Bi212	J	3.48e+00	5.3e-01	3.7e-01	PCI/GDRY	06/12/2012 11:40 CDT
Bi214	J	1.03e+00	1.3e-01	5.7e-02	PCI/GDRY	06/12/2012 11:40 CDT
Co60		-8.62e-03	1.5e-02	2.6e-02	PCI/GDRY	06/12/2012 11:40 CDT
Cs137		2.63e-03	1.9e-02	3.1e-02	PCI/GDRY	06/12/2012 11:40 CDT
I131		-1.19e-01	4.4e-01	7.3e-01	PCI/GDRY	06/12/2012 11:40 CDT
K40		7.68e+00	9.2e-01	2.9e-01	PCI/GDRY	06/12/2012 11:40 CDT
Pb212	J	3.37e+00	3.7e-01	5.4e-02	PCI/GDRY	06/12/2012 11:40 CDT
Pb214	J	1.29e+00	1.6e-01	7.0e-02	PCI/GDRY	06/12/2012 11:40 CDT
Ra224		4.39e+00	7.9e-01	9.6e-01	PCI/GDRY	06/12/2012 11:40 CDT
Ra226	J	2.68e+00	6.1e-01	6.9e-01	PCI/GDRY	06/12/2012 11:40 CDT
Ra228		3.54e+00	4.0e-01	1.1e-01	PCI/GDRY	06/12/2012 11:40 CDT
Th234	J	1.61e+00	7.7e-01	1.1e+00	PCI/GDRY	06/12/2012 11:40 CDT
Tl208	J	9.63e-01	1.1e-01	3.1e-02	PCI/GDRY	06/12/2012 11:40 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06522W	Amount analyzed:	1.210e+02 GDRY
Client sample ID:	AREA C EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 11:40 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	95.06 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/20/2012 15:41	1000.0	GE04	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	1.75e-03	2.2e-01	3.8e-01	PCI/GDRY	06/12/2012 11:40 CDT
Bi212 J	3.33e+00	4.4e-01	2.6e-01	PCI/GDRY	06/12/2012 11:40 CDT
Bi214 J	1.05e+00	1.2e-01	4.0e-02	PCI/GDRY	06/12/2012 11:40 CDT
Co60	-1.49e-03	1.1e-02	1.9e-02	PCI/GDRY	06/12/2012 11:40 CDT
Cs137	2.02e-03	9.2e-03	1.5e-02	PCI/GDRY	06/12/2012 11:40 CDT
I131	-6.89e-04	2.7e-01	4.4e-01	PCI/GDRY	06/12/2012 11:40 CDT
K40	7.41e+00	8.5e-01	2.2e-01	PCI/GDRY	06/12/2012 11:40 CDT
Pb212 J	3.29e+00	3.6e-01	3.0e-02	PCI/GDRY	06/12/2012 11:40 CDT
Pb214 J	1.26e+00	1.4e-01	4.1e-02	PCI/GDRY	06/12/2012 11:40 CDT
Ra224	3.36e+00	5.1e-01	5.5e-01	PCI/GDRY	06/12/2012 11:40 CDT
Ra226 J	2.40e+00	3.9e-01	3.8e-01	PCI/GDRY	06/12/2012 11:40 CDT
Ra228	3.34e+00	3.7e-01	6.6e-02	PCI/GDRY	06/12/2012 11:40 CDT
Th234 J	1.40e+00	2.8e-01	3.4e-01	PCI/GDRY	06/12/2012 11:40 CDT
Tl208 J	9.47e-01	1.1e-01	2.1e-02	PCI/GDRY	06/12/2012 11:40 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06523X	Amount analyzed:	1.568e+02 GDRY
Client sample ID:	AREA A EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 11:55 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	98.19 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/19/2012 16:42	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	1.17e-01	3.8e-01	6.4e-01	PCI/GDRY	06/12/2012 11:55 CDT
Bi212 J	2.44e+00	4.0e-01	3.1e-01	PCI/GDRY	06/12/2012 11:55 CDT
Bi214 J	1.18e+00	1.4e-01	5.1e-02	PCI/GDRY	06/12/2012 11:55 CDT
Co60	8.41e-03	1.3e-02	2.1e-02	PCI/GDRY	06/12/2012 11:55 CDT
I131	-1.73e-01	3.5e-01	5.8e-01	PCI/GDRY	06/12/2012 11:55 CDT
K40	1.13e+01	1.3e+00	2.4e-01	PCI/GDRY	06/12/2012 11:55 CDT
Pb212 J	2.05e+00	2.3e-01	4.4e-02	PCI/GDRY	06/12/2012 11:55 CDT
Pb214 J	1.36e+00	1.6e-01	5.4e-02	PCI/GDRY	06/12/2012 11:55 CDT
Ra224	2.13e+00	5.2e-01	7.4e-01	PCI/GDRY	06/12/2012 11:55 CDT
Ra226 J	2.52e+00	5.0e-01	5.5e-01	PCI/GDRY	06/12/2012 11:55 CDT
Ra228	2.39e+00	2.7e-01	9.8e-02	PCI/GDRY	06/12/2012 11:55 CDT
Th234 J	1.48e+00	7.0e-01	9.8e-01	PCI/GDRY	06/12/2012 11:55 CDT
Tl208 J	6.29e-01	7.2e-02	2.1e-02	PCI/GDRY	06/12/2012 11:55 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06524Y	Amount analyzed:	1.533e+02 GDRY
Client sample ID:	AREA B3 EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 12:05 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	99.03 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/19/2012 21:45	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	-4.29e-02	3.3e-01	5.5e-01	PCI/GDRY	06/12/2012 12:05 CDT
Bi212 J	1.42e+00	3.0e-01	2.8e-01	PCI/GDRY	06/12/2012 12:05 CDT
Bi214 J	7.75e-01	9.9e-02	5.1e-02	PCI/GDRY	06/12/2012 12:05 CDT
Co60	8.61e-03	1.2e-02	2.0e-02	PCI/GDRY	06/12/2012 12:05 CDT
Cs137	6.21e-03	1.4e-02	2.3e-02	PCI/GDRY	06/12/2012 12:05 CDT
I131	-1.42e-01	3.2e-01	5.3e-01	PCI/GDRY	06/12/2012 12:05 CDT
K40	1.10e+01	1.3e+00	2.6e-01	PCI/GDRY	06/12/2012 12:05 CDT
Pb212 J	1.26e+00	1.4e-01	4.0e-02	PCI/GDRY	06/12/2012 12:05 CDT
Pb214 J	9.24e-01	1.1e-01	4.8e-02	PCI/GDRY	06/12/2012 12:05 CDT
Ra224	9.23e-01	4.1e-01	6.4e-01	PCI/GDRY	06/12/2012 12:05 CDT
Ra226 J	1.81e+00	4.4e-01	5.1e-01	PCI/GDRY	06/12/2012 12:05 CDT
Ra228	1.40e+00	1.8e-01	8.8e-02	PCI/GDRY	06/12/2012 12:05 CDT
Th234 J	9.25e-01	5.9e-01	8.6e-01	PCI/GDRY	06/12/2012 12:05 CDT
Tl208 J	4.02e-01	5.0e-02	2.2e-02	PCI/GDRY	06/12/2012 12:05 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06525Z	Amount analyzed:	1.487e+02 GDRY
Client sample ID:	AREA B2 EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 12:15 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	95.51 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/20/2012 02:47	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	9.48e-03	2.5e-01	4.2e-01	PCI/GDRY	06/12/2012 12:15 CDT
Bi212 J	1.65e+00	3.4e-01	2.9e-01	PCI/GDRY	06/12/2012 12:15 CDT
Bi214 J	8.20e-01	1.0e-01	4.9e-02	PCI/GDRY	06/12/2012 12:15 CDT
Co60	-6.23e-04	8.6e-03	1.5e-02	PCI/GDRY	06/12/2012 12:15 CDT
Cs137	3.02e-03	1.5e-02	2.5e-02	PCI/GDRY	06/12/2012 12:15 CDT
I131	2.17e-01	3.0e-01	4.9e-01	PCI/GDRY	06/12/2012 12:15 CDT
K40	1.04e+01	1.2e+00	2.6e-01	PCI/GDRY	06/12/2012 12:15 CDT
Pb212 J	1.38e+00	1.6e-01	4.1e-02	PCI/GDRY	06/12/2012 12:15 CDT
Pb214 J	9.83e-01	1.2e-01	5.2e-02	PCI/GDRY	06/12/2012 12:15 CDT
Ra224	1.78e+00	4.5e-01	6.4e-01	PCI/GDRY	06/12/2012 12:15 CDT
Ra226 J	1.78e+00	4.4e-01	5.2e-01	PCI/GDRY	06/12/2012 12:15 CDT
Ra228	1.50e+00	1.8e-01	8.0e-02	PCI/GDRY	06/12/2012 12:15 CDT
Th234 J	9.90e-01	6.1e-01	8.8e-01	PCI/GDRY	06/12/2012 12:15 CDT
Tl208 J	4.19e-01	5.3e-02	2.6e-02	PCI/GDRY	06/12/2012 12:15 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06526A	Amount analyzed:	1.393e+02 GDRY
Client sample ID:	AREA B1 EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 12:35 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	92.07 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/19/2012 15:01	1000.0	GE04	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	7.67e-02	2.2e-01	3.7e-01	PCI/GDRY	06/12/2012 12:35 CDT
Bi212 J	1.53e+00	2.6e-01	2.2e-01	PCI/GDRY	06/12/2012 12:35 CDT
Bi214 J	8.68e-01	1.0e-01	3.3e-02	PCI/GDRY	06/12/2012 12:35 CDT
Co60	3.07e-03	8.0e-03	1.3e-02	PCI/GDRY	06/12/2012 12:35 CDT
Cs137	3.29e-03	1.0e-02	1.7e-02	PCI/GDRY	06/12/2012 12:35 CDT
I131	1.15e-02	2.1e-01	3.5e-01	PCI/GDRY	06/12/2012 12:35 CDT
K40	1.06e+01	1.2e+00	1.9e-01	PCI/GDRY	06/12/2012 12:35 CDT
Pb212 J	1.29e+00	1.4e-01	2.5e-02	PCI/GDRY	06/12/2012 12:35 CDT
Pb214 J	1.02e+00	1.1e-01	3.1e-02	PCI/GDRY	06/12/2012 12:35 CDT
Ra224	1.28e+00	2.9e-01	4.1e-01	PCI/GDRY	06/12/2012 12:35 CDT
Ra226 J	1.92e+00	3.3e-01	3.3e-01	PCI/GDRY	06/12/2012 12:35 CDT
Ra228	1.36e+00	1.6e-01	6.1e-02	PCI/GDRY	06/12/2012 12:35 CDT
Th234 J	1.10e+00	2.6e-01	3.4e-01	PCI/GDRY	06/12/2012 12:35 CDT
Tl208 J	3.93e-01	4.6e-02	1.8e-02	PCI/GDRY	06/12/2012 12:35 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.06527B	Amount analyzed:	1.438e+02 GDRY
Client sample ID:	AREA D EPA#1-5	Preparation batch #:	0008916N
Matrix:	SOIL	Assay batch #:	0016109V
Collected:	2012-06-12 12:55 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	96.51 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/19/2012 13:55	1000.0	GE17	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	-1.42e-02	2.9e-01	4.8e-01	PCI/GDRY	06/12/2012 12:55 CDT
Bi212 J	8.37e-01	2.6e-01	2.9e-01	PCI/GDRY	06/12/2012 12:55 CDT
Bi214 J	9.94e-01	1.1e-01	3.8e-02	PCI/GDRY	06/12/2012 12:55 CDT
Co60	-3.41e-03	1.2e-02	2.0e-02	PCI/GDRY	06/12/2012 12:55 CDT
Cs137	3.98e-03	1.3e-02	2.1e-02	PCI/GDRY	06/12/2012 12:55 CDT
I131	-1.46e-03	2.3e-01	3.8e-01	PCI/GDRY	06/12/2012 12:55 CDT
K40	1.14e+01	1.3e+00	1.9e-01	PCI/GDRY	06/12/2012 12:55 CDT
Pb212 J	7.77e-01	8.8e-02	3.2e-02	PCI/GDRY	06/12/2012 12:55 CDT
Pb214 J	1.22e+00	1.4e-01	4.2e-02	PCI/GDRY	06/12/2012 12:55 CDT
Ra224	4.93e-01	1.6e-01	2.3e-01	PCI/GDRY	06/12/2012 12:55 CDT
Ra226 J	2.19e+00	3.4e-01	3.1e-01	PCI/GDRY	06/12/2012 12:55 CDT
Ra228	8.62e-01	1.3e-01	1.1e-01	PCI/GDRY	06/12/2012 12:55 CDT
Th234 J	1.24e+00	2.9e-01	3.5e-01	PCI/GDRY	06/12/2012 12:55 CDT
Tl208 J	2.51e-01	3.5e-02	2.7e-02	PCI/GDRY	06/12/2012 12:55 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	LCS-00643066U	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0008916N
Matrix:	N/A	Assay batch #:	0016109V
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/19/2012 13:46	1000.0	GE23	MO

ANALYTICAL RESULTS

Analyte		Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi207		3.44e+03	3.7e+02	5.3e+00	PCI	12/15/2010 11:00 CDT
Bi212	J	1.53e+02	6.3e+01	7.8e+01	PCI	12/15/2010 11:00 CDT
Bi214	J	6.31e+01	9.2e+00	7.7e+00	PCI	12/15/2010 11:00 CDT
Co60		6.58e-02	2.9e+00	4.9e+00	PCI	12/15/2010 11:00 CDT
Cs137		-1.31e+00	3.1e+00	5.1e+00	PCI	12/15/2010 11:00 CDT
Eu155		8.53e+02	9.5e+01	1.4e+01	PCI	12/15/2010 11:00 CDT
K40		1.15e+02	3.5e+01	3.8e+01	PCI	12/15/2010 11:00 CDT
Pb212	J	1.18e+02	1.5e+01	9.5e+00	PCI	12/15/2010 11:00 CDT
Pb214	J	8.59e+01	1.3e+01	1.2e+01	PCI	12/15/2010 11:00 CDT
Ra226	J	1.35e+02	6.3e+01	8.9e+01	PCI	12/15/2010 11:00 CDT
Ra228		1.34e+02	2.0e+01	2.2e+01	PCI	12/15/2010 11:00 CDT
Tl208	J	3.65e+01	5.4e+00	4.7e+00	PCI	12/15/2010 11:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200027

SAMPLE ANALYSIS REPORT

Lab sample #:	RBK-00643065T	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0008916N
Matrix:	N/A	Assay batch #:	0016109V
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
07/20/2012 15:42	1000.0	GE17	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	6.00e-01	5.1e+00	8.5e+00	PCI	07/17/2012 07:00 CDT
Be7	8.91e+00	1.0e+01	1.7e+01	PCI	07/17/2012 07:00 CDT
Co60	-1.17e-01	8.9e-01	1.5e+00	PCI	07/17/2012 07:00 CDT
Cs137	-8.73e-03	1.3e+00	2.2e+00	PCI	07/17/2012 07:00 CDT
I131	-2.61e-02	1.6e+00	2.6e+00	PCI	07/17/2012 07:00 CDT
K40	-1.24e+01	2.4e+01	2.3e+01	PCI	07/17/2012 07:00 CDT
Pb214 J	6.72e+00	3.2e+00	3.8e+00	PCI	07/17/2012 07:00 CDT
Ra226 J	1.69e+01	2.1e+01	3.5e+01	PCI	07/17/2012 07:00 CDT
Ra228	1.15e+01	8.5e+00	1.4e+01	PCI	07/17/2012 07:00 CDT
Tl208 J	2.42e+00	2.2e+00	3.3e+00	PCI	07/17/2012 07:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG 1200027

PREPARATION BATCH SUMMARY

Preparation batch #: 0008916N
Analysis method: NAREL GAM-01
Preparation procedure: N/A

NAREL Sample #	Client Sample ID	Analysis #	QC Type	Yield	$\pm 2 \sigma$ Uncertainty	Analyst
B2.06522W	AREA C EPA#1-5	00640959L	DUP	N/A		MO
B2.06522W	AREA C EPA#1-5	00643067V		N/A		MO
B2.06523X	AREA A EPA#1-5	00640960D		N/A		MO
B2.06524Y	AREA B3 EPA#1-5	00640961E		N/A		MO
B2.06525Z	AREA B2 EPA#1-5	00640962F		N/A		MO
B2.06526A	AREA B1 EPA#1-5	00640963G		N/A		MO
B2.06527B	AREA D EPA#1-5	00640964H		N/A		MO
LCS-00643066U *		00643066U	LCS	N/A		MO
RBK-00643065T *		00643065T	RBK	N/A		MO

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

QC RESULTS FOR BATCH 0008916N

NAREL Sample #	Analysis #	QC Type	Analyte	%R	RPD	Z	Evaluation
B2.06522W	00643067V	DUP	BA140		70.9	-0.01	PASS
B2.06522W	00643067V	DUP	BI212		4.3	-0.43	PASS-J
B2.06522W	00643067V	DUP	BI214		1.7	0.20	PASS-J
B2.06522W	00643067V	DUP	CO60		-140.9	0.75	PASS
B2.06522W	00643067V	DUP	CS137		26.2	-0.06	PASS
B2.06522W	00643067V	DUP	I131		-197.7	0.46	PASS
B2.06522W	00643067V	DUP	K40		3.6	-0.43	PASS
B2.06522W	00643067V	DUP	PB212		2.3	-0.30	PASS-J
B2.06522W	00643067V	DUP	PB214		1.7	-0.20	PASS-J
B2.06522W	00643067V	DUP	RA224		26.5	-2.20	WARN
B2.06522W	00643067V	DUP	RA226		11.0	-0.77	PASS-J
B2.06522W	00643067V	DUP	RA228		5.9	-0.74	PASS
B2.06522W	00643067V	DUP	TH234		13.4	-0.49	PASS-J
B2.06522W	00643067V	DUP	TL208		1.7	-0.21	PASS-J
LCS-00643066U	00643066U	LCS	BI207	96.2		-0.69	PASS
LCS-00643066U	00643066U	LCS	EU155	109.7		1.45	PASS
RBK-00643065T	00643065T	RBK	BA140				PASS
RBK-00643065T	00643065T	RBK	BE7				PASS
RBK-00643065T	00643065T	RBK	CO60				PASS
RBK-00643065T	00643065T	RBK	CS137				PASS
RBK-00643065T	00643065T	RBK	I131				PASS
RBK-00643065T	00643065T	RBK	K40				PASS
RBK-00643065T	00643065T	RBK	PB214				HIGH-J
RBK-00643065T	00643065T	RBK	RA226				PASS-J
RBK-00643065T	00643065T	RBK	RA228				WARN
RBK-00643065T	00643065T	RBK	TL208				WARN-J

Note: Results qualified with -J may be significantly under or over-estimated and are not evaluated for QC purposes.

Sample B3-HS1



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION AND INDOOR AIR**

National Air and Radiation Environmental Laboratory
540 South Morris Avenue, Montgomery, AL 36115-2601
(334) 270-3400

August 21, 2012

MEMORANDUM

SUBJECT: Radiochemical Results for
Dusable Park Samples

FROM: John G. Griggs, Acting Director *John Griggs*
Center for Environmental Radioanalytical Laboratory Science

TO: Eugene Jablonowski, Health Physicist
Region 5

Attached is a data package for gamma analysis of samples collected from the Dusable Park in Chicago, IL. The samples constitute NAREL batch number 1200031.

Specific information concerning all aspects of the radiological analysis of the samples is contained in the batch case narratives of the data packages. If you have any questions concerning the analytical results, please contact me at (334)270-7052.

Attachments

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
GAMMA ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1200031

Project: Region 5, Dusable Park, Chicago, IL
Analysis method: Gamma Spectrometry
Report ID: 1200031-GAMMA
Report type: Original
Date reported: 08/21/2012
Total pages in report: 11

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2.07153V	B3-HS1	IL:CHICAGO	SOIL	06/08/2012	07/03/2012
B2.07154W	B3-HS1 DUP	IL:CHICAGO	SOIL	06/08/2012	07/03/2012

EXCEPTIONS

1. **Packaging and shipping** – No problems were observed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – Samples had elevated screening results upon receipt. Precautions were taken to minimize cross-contamination.
4. **Analysis** – Samples were held for 21 days before analysis to allow for ingrowth.
5. **Holding times** – No holding times were specified.

QUALITY CONTROL

1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

Mary Wisdom
Mary F. Wisdom
Quality Assurance Manager, NAREL

8-21-12
Date

John Griggs
John G. Griggs
Acting Director, Center for Environmental Radioanalytical
Laboratory Science

8/21/12
Date

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank
STD	External standard (used for ^{228}Ra yield determination)

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

RADIOCHEMICAL DATA

Radiochemical analyses usually require the subtraction of an instrument background measurement result from a gross sample measurement result. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical importance, as for example in the evaluation of trends or the comparison of two groups of samples.

To the extent practical, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the "2-sigma" measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The measurement result, uncertainty, and MDC are always expressed in the same unit of measurement.

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of method blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity, 2-sigma uncertainty, and a sample-specific estimate of the MDC for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected above background with the exception of client requested nuclides of interest. The activity for each of the requested nuclides is reported whether negative, positive, or zero along with the associated 2-sigma uncertainty and the sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for ^{214}Bi , ^{214}Pb , ^{234}Th , $^{234\text{m}}\text{Pa}$, ^{226}Ra , ^{231}Th , and ^{235}U are subject to greater uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma expanded uncertainty that is reported with each result. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between ^{226}Ra and ^{235}U , NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for ^{226}Ra activities can be obtained from the reported activities of its decay products, ^{214}Pb and ^{214}Bi , which are likely to be somewhat less than the ^{226}Ra activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as ^{131}I and ^{140}Ba , when there is a long delay between collection and analysis.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200031

ANALYSIS SUMMARY

Analysis method: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	Client Sample ID	QC Type	Date Completed	Preparation Batch #	Assay Batch #
B2.07153V	B3-HS1	DUP	08/10/2012	0008990Z	0016169H
B2.07153V	B3-HS1		08/14/2012	0008990Z	0016169H
B2.07154W	B3-HS1 DUP		08/11/2012	0008990Z	0016169H
LCS-00645372K *		LCS	08/14/2012	0008990Z	0016169H
RBK-00645373L *		RBK	08/14/2012	0008990Z	0016169H

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200031

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.07153V	Amount analyzed:	2.221e+02 GDRY
Client sample ID:	B3-HS1	Preparation batch #:	0008990Z
Matrix:	SOIL	Assay batch #:	0016169H
Collected:	2012-06-08 13:00 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	70.58 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/10/2012 16:14	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	-1.61e+01	2.5e+01	4.1e+01	PCI/GDRY	06/08/2012 13:00 CDT
Be7	3.96e+01	6.0e+00	6.7e+00	PCI/GDRY	06/08/2012 13:00 CDT
Bi212 J	1.36e+03	1.5e+02	5.4e+00	PCI/GDRY	06/08/2012 13:00 CDT
Bi214 J	6.13e+00	8.3e-01	6.3e-01	PCI/GDRY	06/08/2012 13:00 CDT
Co60	4.27e-03	1.5e-01	2.5e-01	PCI/GDRY	06/08/2012 13:00 CDT
Cs137	-3.42e-01	2.6e-01	4.2e-01	PCI/GDRY	06/08/2012 13:00 CDT
I131	2.92e+01	5.0e+01	8.3e+01	PCI/GDRY	06/08/2012 13:00 CDT
K40	9.11e+01	1.0e+01	2.2e+00	PCI/GDRY	06/08/2012 13:00 CDT
Pa234m J	1.13e+02	1.9e+01	2.1e+01	PCI/GDRY	06/08/2012 13:00 CDT
Pb212 J	1.26e+03	1.4e+02	8.5e-01	PCI/GDRY	06/08/2012 13:00 CDT
Pb214 J	6.34e+00	9.0e-01	7.5e-01	PCI/GDRY	06/08/2012 13:00 CDT
Ra224	1.31e+03	1.4e+02	1.7e+01	PCI/GDRY	06/08/2012 13:00 CDT
Ra226 J	1.76e+01	6.0e+00	9.4e+00	PCI/GDRY	06/08/2012 13:00 CDT
Ra228	1.33e+03	1.4e+02	1.1e+00	PCI/GDRY	06/08/2012 13:00 CDT
Rn220	1.36e+03	2.0e+02	2.2e+02	PCI/GDRY	06/08/2012 13:00 CDT
Th228	1.56e+03	2.0e+02	1.4e+02	PCI/GDRY	06/08/2012 13:00 CDT
Th234 J	6.04e+01	1.4e+01	1.9e+01	PCI/GDRY	06/08/2012 13:00 CDT
Tl208 J	3.98e+02	4.3e+01	4.4e-01	PCI/GDRY	06/08/2012 13:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200031

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.07153V	Amount analyzed:	2.221e+02 GDRY
Client sample ID:	B3-HS1	Preparation batch #:	0008990Z
Matrix:	SOIL	Assay batch #:	0016169H
Collected:	2012-06-08 13:00 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	70.58 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/13/2012 12:40	1000.0	GE23	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	-1.69e+01	2.1e+01	3.4e+01	PCI/GDRY	06/08/2012 13:00 CDT
Be7	4.98e+01	6.1e+00	4.1e+00	PCI/GDRY	06/08/2012 13:00 CDT
Bi212 J	1.36e+03	1.5e+02	4.0e+00	PCI/GDRY	06/08/2012 13:00 CDT
Bi214 J	6.63e+00	8.0e-01	4.7e-01	PCI/GDRY	06/08/2012 13:00 CDT
Co60	5.53e-03	1.2e-01	2.0e-01	PCI/GDRY	06/08/2012 13:00 CDT
I131	3.76e+01	4.4e+01	7.2e+01	PCI/GDRY	06/08/2012 13:00 CDT
K40	9.15e+01	1.0e+01	1.7e+00	PCI/GDRY	06/08/2012 13:00 CDT
Pa234m J	1.50e+02	2.0e+01	1.5e+01	PCI/GDRY	06/08/2012 13:00 CDT
Pb212 J	1.38e+03	1.5e+02	4.0e-01	PCI/GDRY	06/08/2012 13:00 CDT
Pb214 J	6.92e+00	8.0e-01	4.8e-01	PCI/GDRY	06/08/2012 13:00 CDT
Ra224	1.38e+03	1.5e+02	9.5e+00	PCI/GDRY	06/08/2012 13:00 CDT
Ra226 J	1.11e+01	3.2e+00	4.9e+00	PCI/GDRY	06/08/2012 13:00 CDT
Ra228	1.31e+03	1.4e+02	7.6e-01	PCI/GDRY	06/08/2012 13:00 CDT
Rn220	1.13e+03	1.7e+02	1.7e+02	PCI/GDRY	06/08/2012 13:00 CDT
Th228	1.66e+03	1.9e+02	7.9e+01	PCI/GDRY	06/08/2012 13:00 CDT
Th234 J	6.55e+01	8.4e+00	7.1e+00	PCI/GDRY	06/08/2012 13:00 CDT
Tl208 J	4.11e+02	4.4e+01	3.1e-01	PCI/GDRY	06/08/2012 13:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200031

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.07154W	Amount analyzed:	3.270e+01 GDRY
Client sample ID:	B3-HS1 DUP	Preparation batch #:	0008990Z
Matrix:	SOIL	Assay batch #:	0016169H
Collected:	2012-06-08 13:00 CDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	71.85 %	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/10/2012 15:19	1000.0	GE05	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	3.78e+00	7.9e+01	1.3e+02	PCI/GDRY	06/08/2012 13:00 CDT
Be7	1.09e+02	1.7e+01	2.0e+01	PCI/GDRY	06/08/2012 13:00 CDT
Bi212 J	3.78e+03	4.1e+02	1.8e+01	PCI/GDRY	06/08/2012 13:00 CDT
Bi214 J	1.57e+01	2.3e+00	2.1e+00	PCI/GDRY	06/08/2012 13:00 CDT
Co60	-2.04e-02	6.7e-01	1.1e+00	PCI/GDRY	06/08/2012 13:00 CDT
Cs137	-8.71e-01	8.8e-01	1.4e+00	PCI/GDRY	06/08/2012 13:00 CDT
I131	1.30e+02	1.4e+02	2.3e+02	PCI/GDRY	06/08/2012 13:00 CDT
K40	2.63e+02	2.9e+01	9.5e+00	PCI/GDRY	06/08/2012 13:00 CDT
Pa234m J	1.75e+02	5.2e+01	7.7e+01	PCI/GDRY	06/08/2012 13:00 CDT
Pb212 J	3.34e+03	3.6e+02	2.9e+00	PCI/GDRY	06/08/2012 13:00 CDT
Pb214 J	1.49e+01	2.1e+00	1.9e+00	PCI/GDRY	06/08/2012 13:00 CDT
Ra224	3.53e+03	3.8e+02	4.8e+01	PCI/GDRY	06/08/2012 13:00 CDT
Ra226 J	1.65e+01	1.1e+01	1.7e+01	PCI/GDRY	06/08/2012 13:00 CDT
Ra228	3.75e+03	4.0e+02	3.8e+00	PCI/GDRY	06/08/2012 13:00 CDT
Rn220	3.82e+03	6.0e+02	7.0e+02	PCI/GDRY	06/08/2012 13:00 CDT
Th228	4.29e+03	5.1e+02	3.0e+02	PCI/GDRY	06/08/2012 13:00 CDT
Th234 J	1.30e+02	4.1e+01	6.3e+01	PCI/GDRY	06/08/2012 13:00 CDT
Tl208 J	1.13e+03	1.2e+02	1.4e+00	PCI/GDRY	06/08/2012 13:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200031

SAMPLE ANALYSIS REPORT

Lab sample #:	LCS-00645372K	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0008990Z
Matrix:	N/A	Assay batch #:	0016169H
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/13/2012 11:25	1000.0	GE04	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi207	2.63e+03	2.8e+02	4.6e+00	PCI	12/15/2010 11:00 CDT
Co60	6.23e-01	2.3e+00	3.8e+00	PCI	12/15/2010 11:00 CDT
Cs137	3.62e-01	2.4e+00	4.0e+00	PCI	12/15/2010 11:00 CDT
Eu155	6.31e+02	7.0e+01	9.5e+00	PCI	12/15/2010 11:00 CDT
K40	-5.57e+00	2.7e+01	3.6e+01	PCI	12/15/2010 11:00 CDT
Ra226	-7.69e+00	4.7e+01	6.6e+01	PCI	12/15/2010 11:00 CDT
Ra228	1.61e+00	1.1e+01	1.9e+01	PCI	12/15/2010 11:00 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200031

SAMPLE ANALYSIS REPORT

Lab sample #:	RBK-00645373L	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0008990Z
Matrix:	N/A	Assay batch #:	0016169H
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
08/13/2012 11:27	1000.0	GE05	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Ba140	1.65e+00	3.8e+00	6.4e+00	PCI	08/10/2012 12:00 CDT
Co60	6.25e-01	9.5e-01	1.6e+00	PCI	08/10/2012 12:00 CDT
Cs137	7.25e-01	1.0e+00	1.7e+00	PCI	08/10/2012 12:00 CDT
I131	3.55e-01	1.1e+00	1.8e+00	PCI	08/10/2012 12:00 CDT
K40	-5.86e+00	1.6e+01	2.5e+01	PCI	08/10/2012 12:00 CDT
Ra226 J	-8.83e+00	2.5e+01	2.9e+01	PCI	08/10/2012 12:00 CDT
Ra228	-1.76e+00	6.8e+00	7.9e+00	PCI	08/10/2012 12:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG 1200031

PREPARATION BATCH SUMMARY

Preparation batch #: 0008990Z
Analysis method: NAREL GAM-01
Preparation procedure: N/A

NAREL Sample #	Client Sample ID	Analysis #	QC Type	Yield	$\pm 2 \sigma$ Uncertainty	Analyst
B2.07153V	B3-HS1	00642292Y		N/A		MO
B2.07153V	B3-HS1	00645371J	DUP	N/A		MO
B2.07154W	B3-HS1 DUP	00642293Z		N/A		MO
LCS-00645372K *		00645372K	LCS	N/A		MO
RBK-00645373L *		00645373L	RBK	N/A		MO

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

QC RESULTS FOR BATCH 0008990Z

NAREL Sample #	Analysis #	QC Type	Analyte	%R	RPD	Z	Evaluation
B2.07153V	00645371J	DUP	BA140		-5.0	-0.05	PASS
B2.07153V	00645371J	DUP	BE7		22.9	2.40	WARN
B2.07153V	00645371J	DUP	BI212		0.3	-0.04	PASS-J
B2.07153V	00645371J	DUP	BI214		7.8	0.86	PASS-J
B2.07153V	00645371J	DUP	CO60		25.7	0.01	PASS
B2.07153V	00645371J	DUP	CS137				Unmatched
B2.07153V	00645371J	DUP	II31		25.0	0.25	PASS
B2.07153V	00645371J	DUP	K40		0.4	0.05	PASS
B2.07153V	00645371J	DUP	PA234M		28.3	2.70	WARN-J
B2.07153V	00645371J	DUP	PB212		8.8	1.14	PASS-J
B2.07153V	00645371J	DUP	PB214		8.8	0.97	PASS-J
B2.07153V	00645371J	DUP	RA224		5.5	0.72	PASS
B2.07153V	00645371J	DUP	RA226		45.0	-1.89	PASS-J
B2.07153V	00645371J	DUP	RA228		1.3	-0.18	PASS
B2.07153V	00645371J	DUP	RN220		19.0	-1.79	PASS
B2.07153V	00645371J	DUP	TH228		6.7	0.80	PASS
B2.07153V	00645371J	DUP	TH234		8.0	0.63	PASS-J
B2.07153V	00645371J	DUP	TL208		3.0	0.40	PASS-J
LCS-00645372K	00645372K	LCS	BI207	93.9		-1.13	PASS
LCS-00645372K	00645372K	LCS	EU155	104.0		0.63	PASS
RBK-00645373L	00645373L	RBK	BA140				PASS
RBK-00645373L	00645373L	RBK	CO60				PASS
RBK-00645373L	00645373L	RBK	CS137				PASS
RBK-00645373L	00645373L	RBK	II31				PASS
RBK-00645373L	00645373L	RBK	K40				PASS
RBK-00645373L	00645373L	RBK	RA226				PASS-J
RBK-00645373L	00645373L	RBK	RA228				PASS

Note: Results qualified with -J may be significantly under or over-estimated and are not evaluated for QC purposes.

Appendix E

USEPA Signed Notification of Successful Verification Sampling Forms

DUSABLE PARK

FORM 223-1

NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: Area ADate of Verification Survey: 6/12/12Time of Verification Survey 12 - 2 pm am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: [Signature]Date: 6/13/12Print Name Steve KornderPrint Title Senior Project Geochemist

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 6/13/12. The results of this survey indicate that the verification criteria as contained in the Cooperative Agreement have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date 6/13/12Print Name Veeneta SimonPrint Title On-Scene Coordinator

For USEPA Region 5

DUSABLE PARK

FORM 223-1

NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification:

Area B1

Date of Verification Survey:

6/12/12

Time of Verification Survey

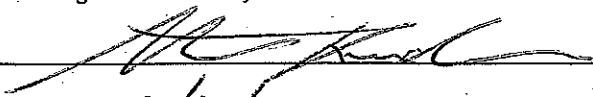
12 - 2pm

am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed:



Date:

6/13/12Print Name Steve KornderPrint Title Senior Project Geochemist

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 6/13/12. The results of this survey indicate that the verification criteria as contained in the Cooperative Agreement have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date

6/13/12

Print Name

Veeneta Simon

Print Title

On-Scene Coordinator

For USEPA Region 5

DUSABLE PARK

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEYArea Identification: Area B2Date of Verification Survey: 6/12/12Time of Verification Survey 10-2 PM am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: [Signature]Date: 6/13/12Print Name Steve KornderPrint Title Senior Project Geochemist

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 6/13/12. The results of this survey indicate that the verification criteria as contained in the Cooperative Agreement have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date 6/13/12Print Name Verneta SimonPrint Title On-Scene Coordinator

For USEPA Region 5

DUSABLE PARK

FORM 223-1

NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification:

Area B3 (Includes March 2008 Area)

Date of Verification Survey:

6/12/12

Time of Verification Survey

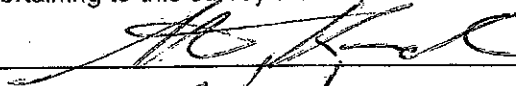
12-2pm

am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed:



Date:

6/13/12Print Name Steve KornderPrint Title Senior Project Geochemist

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 6/13/12. The results of this survey indicate that the verification criteria as contained in the Cooperative Agreement have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date

6/13/12

Print Name

Veeneha Simon

Print Title

On-Scene Coordinator

For USEPA Region 5

DUSABLE PARK

FORM 223-1

NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: Area CDate of Verification Survey: 6/12/12Time of Verification Survey 12-2pm am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed: [Signature]Date: 6/13/12Print Name Steve KornderPrint Title Senior Project Geochemist

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 6/13/12. The results of this survey indicate that the verification criteria as contained in the Cooperative Agreement have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date 6/13/12Print Name Verneta SimonPrint Title On-Scene Coordinator

For USEPA Region 5

DUSABLE PARK

FORM 223-1

NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification:

Area D (October 2007)

Date of Verification Survey:

6/12/12

Time of Verification Survey

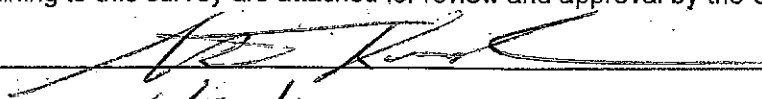
12-2pm

am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed:



Date:

6/13/12Print Name Steve KornderPrint Title Senior Project Geochemist

AECOM

The attached Verification Survey documents were reviewed by USEPA, Region 5 on 6/13/12. The results of this survey indicate that the verification criteria as contained in the Cooperative Agreement have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date

6/13/12

Print Name

Verneta Simon

Print Title

On-Scene Coordinator

For USEPA Region 5

Gamma Spec Report - AECOM DuSable Park June 2012

Stan A. Huber Consultants, Inc.
200 North Cedar Road
New Lenox, IL 60451
(800) 383-0468

Instrument ID:

Canberra Genie 2000 NaI Gamma Spec System
2"x2" NaI detector w/ pulse height analysis software package

Exclusion Zone Confirmatory Samples for June 12, 2012

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3786	6/12/2012	DuSable Park EPA	Area C EPA #1	25.8	5.13	6.08	3.63	1.77	0.6	2.36	4.23	2.95
3787	6/12/2012	DuSable Park EPA	Area C EPA #2	24.9	1.19	5.43	5.01	1.62	-0.26	2.06	4.75	2.62
3788	6/12/2012	DuSable Park EPA	Area C EPA #3	25.2	9.58	5.44	2.29	1.58	2.77	2.06	5.06	2.60
3789	6/12/2012	DuSable Park EPA	Area C EPA #4	26.1	4.02	4.17	3.78	1.25	2.06	1.61	5.84	2.04
3790	6/12/2012	DuSable Park EPA	Area C EPA #5	25.6	10.84	5.26	3.64	1.5	0.73	1.95	4.37	2.46
Average Total Radium (Th-232+Ra-226) Concentration for : Area C Exclusion Zone											4.85	pCi/g

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3791	6/12/2012	DuSable Park EPA	Area A EPA #1	31.8	5.32	5.46	3.73	1.59	-0.12	2	3.61	2.56
3792	6/12/2012	DuSable Park EPA	Area A EPA #2	32.6	7.71	3.92	2.21	1.16	3.75	1.52	5.96	1.91
3793	6/12/2012	DuSable Park EPA	Area A EPA #3	30.7	-0.74	7.18	3.72	2.19	1.02	2.84	4.74	3.59
3794	6/12/2012	DuSable Park EPA	Area A EPA #4	38.9	6.55	4.15	2.27	1.23	2.63	1.61	4.9	2.03
3795	6/12/2012	DuSable Park EPA	Area A EPA #5	39.2	12.72	4.69	1.68	1.35	3.47	1.77	5.15	2.23
Average Total Radium (Th-232+Ra-226) Concentration for : Area A Exclusion Zone											4.87	pCi/g

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3796	6/12/2012	DuSable Park EPA	Area B3 EPA #1	31.6	10.03	4.75	1.67	1.39	1.65	1.77	3.32	2.25
3797	6/12/2012	DuSable Park EPA	Area B3 EPA #2	30.1	6.04	4.42	0.71	1.3	1.85	1.73	2.56	2.16
3798	6/12/2012	DuSable Park EPA	Area B3 EPA #3	30.6	8.93	4.79	0.76	1.39	2.93	1.88	3.69	2.34
3799	6/12/2012	DuSable Park EPA	Area B3 EPA #4	31.2	7.55	5.35	0.42	1.57	1.81	2.04	2.23	2.57
3800	6/12/2012	DuSable Park EPA	Area B3 EPA #5	31.4	9.67	5.12	1.72	1.48	0.3	1.91	2.02	2.42
Average Total Radium (Th-232+Ra-226) Concentration for : Area B3 Exclusion Zone											2.76	pCi/g

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3801	6/12/2012	DuSable Park EPA	Area B2 EPA #1	30.6	7.8	4.63	-0.02	1.35	3.62	1.88	3.6	2.31
3802	6/12/2012	DuSable Park EPA	Area B2 EPA #2	30.6	8.71	6.08	1.75	1.73	1.85	2.33	3.6	2.90
3803	6/12/2012	DuSable Park EPA	Area B2 EPA #3	31.6	1.07	5.69	2.7	1.72	1.68	2.23	4.38	2.82
3804	6/12/2012	DuSable Park EPA	Area B2 EPA #4	31.6	4.65	4.74	0.9	1.42	2.84	1.9	3.74	2.37
3805	6/12/2012	DuSable Park EPA	Area B2 EPA #5	31.5	6.11	4.34	1.38	1.29	1.38	1.69	2.76	2.13

Average Total Radium (Th-232+Ra-226) Concentration for : **Area B2 Exclusion Zone** 3.62 pCi/g

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3806	6/12/2012	DuSable Park EPA	Area B1 EPA #1	30.5	-3.77	4.18	3.87	1.31	0.34	1.64	4.21	2.10
3807	6/12/2012	DuSable Park EPA	Area B1 EPA #2	30.1	2.2	4.65	1.14	1.41	2.61	1.93	3.75	2.39
3808	6/12/2012	DuSable Park EPA	Area B1 EPA #3	30.3	3.8	5.71	1.31	1.72	2.21	2.29	3.52	2.86
3809	6/12/2012	DuSable Park EPA	Area B1 EPA #4	30.4	6.19	3.31	1.23	0.97	2.31	1.35	3.54	1.66
3810	6/12/2012	DuSable Park EPA	Area B1 EPA #5	30.6	7.83	4.54	0.75	1.33	2.22	1.79	2.97	2.23

Average Total Radium (Th-232+Ra-226) Concentration for : **Area B1 Exclusion Zone** 3.60 pCi/g

Sample ID	Analysis Date	Sample Group	Description	Weight (g)	U-238 Activity	U-238 Uncertainty	Th-232 Activity	Th-232 Uncertainty	Ra-226 Activity	Ra-226 Uncertainty	Total Radium Activity	Total Radium Uncertainty
3811	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #1	30.1	9.24	5.56	0	1.61	3.43	2.17	3.43	2.70
3812	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #2	29.4	7.82	5.02	0.81	1.47	1.78	1.99	2.59	2.47
3813	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #3	30.1	6.67	5.68	2.87	1.63	0.35	2.15	3.22	2.70
3814	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #4	29.1	7.16	4.2	1.13	1.25	0.48	1.63	1.61	2.05
3815	6/12/2012	DuSable Park EPA	Area D Oct07 EPA #5	30.4	8.83	5.21	-0.42	1.52	2.1	2.09	1.68	2.58

Average Total Radium (Th-232+Ra-226) Concentration for : **Area D Oct 07 Exclusion Zone** 2.51 pCi/g

All results are in pCi/gram

** Important Note: System has not been calibrated for U-238 and the analytical results detailed above for U-238 should not be used or considered accurate

Analysis Performed by: Glenn Huber, CHP

Signature

6/12/2012

Date

Appendix F

Shipping Manifests and Truck Surveys



AECOM
750 Corporate Woods Parkway
Vernon Hills, IL 60061

847-279-2500 tel
847-279-2510 fax

September 14, 2012

Dr. Hans Weger, Ph.D.
Waste Licensing Reviewer, Radioactive Materials Division
Texas Commission on Environmental Quality
12100 Park 35 Circle, Building F, MC-233
Austin, TX 78753

Subject: Notification of Shipments from Chicago Park District's DuSable Park (Lindsay Light II Site OU04)

Dear Dr. Weger:

This letter provides notification that shipments of radioactive contaminated fill soil from the Lindsay Light II Site OU4 at 653 E North Water Street, Chicago, Illinois will commence on September 19, 2012. The notification is required as detailed below pursuant to our Region 5 United States Environmental Protection Agency approved work plan and 40 CFR 35.6120.

- *Radioactive Waste Material. Respondent will transport radioactive waste material to a disposal facility licensed to accept radioactive Waste Material from the Site. Prior to the initial shipment of radioactive Waste Material originating from the Site, Respondent shall provide written notification of such shipment to the appropriate state environmental official and to the On-Scene Coordinators.*
- *Respondent shall include in the written notification the following information: 1) the name and location of the facility to which the Waste Material is to be shipped; 2) the type and quantity of the Waste Material to be shipped; 3) the expected schedule for the shipment of the Waste Material; and 4) the method of transportation. Respondent shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.*

The shipment of the material is being arranged by I.C.E. Services, Inc. of Ambridge, Pennsylvania. These shipments of pre-1978 11e(2) byproduct material are being made in 3.5 cubic-yard bags on covered flatbed trailers or as requested by the disposal facility. The materials are being shipped for disposal at the Waste Control Specialists LLC (WCS) in Andrews, Texas. The remediation involves the shipment of approximately 116 cubic-yards of fill soil and there are no immediate plans for additional shipments at this time.

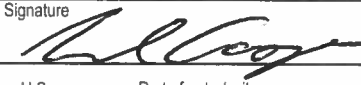
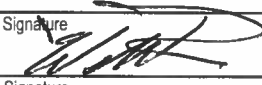
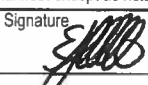
Should you have any questions, please contact us at 847-279-2448.



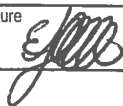
Sincerely,

Steven C. Kornder, Ph.D.
Senior Project Geochemist

John Hyder
Department Manager

cc: Verneta Simon - USEPA
Gene Jablonowski - USEPA
Daniel Cooper - Chicago Park District

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District	2. Page 1 of 1	3. Emergency Response Phone 724-312-1752	4. Manifest Tracking Number 000288658 GBF		
5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St. Chicago, IL 60611				Generator's Site Address (if different than mailing address) 653 E. North Water St. Chicago, IL 60611			
6. Transporter 1 Company Name SLT Express Way Inc.				U.S. EPA ID Number AZR000508515			
7. Transporter 2 Company Name				U.S. EPA ID Number			
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714				U.S. EPA ID Number TXD988088464			
Facility's Phone: 132 526 3500							
GENERATOR	9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
			No.	Type			
		1. Non-Regulated Material	5	BA	20	T	OUTS 3191
		2.					
		3.					
		4.					
14. Special Handling Instructions and Additional Information WP-019686							
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.							
Generator's/Offoror's Printed/Typed Name Daniel Cooper				Signature 		Month Day Year 9 19 12	
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____							
17. Transporter Acknowledgment of Receipt of Materials							
Transporter 1 Printed/Typed Name William Romins				Signature 		Month Day Year 9 19 12	
Transporter 2 Printed/Typed Name				Signature		Month Day Year	
TRANSPORTER INT'L	18. Discrepancy						
	18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection						
	Manifest Reference Number:						
	18b. Alternate Facility (or Generator) U.S. EPA ID Number						
	Facility's Phone:						
DESIGNATED FACILITY	18c. Signature of Alternate Facility (or Generator)						Month Day Year
	19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)						
	1. H132	2.	3.	4.			
	20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a						
	Printed/Typed Name Edward L. Camacho				Signature 		Month Day Year 9 21 12

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District		2. Page 1 of 1		3. Emergency Response Phone 724-312-1752		4. Manifest Tracking Number 000288659 GBF				
		5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St.		Generator's Site Address (if different than mailing address) 653 E. North Water St. Chicago, IL 60611								
Generator's Phone: 312-742-4287												
6. Transporter 1 Company Name SLT Express Way Inc.								U.S. EPA ID Number AZR000508515				
7. Transporter 2 Company Name								U.S. EPA ID Number				
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714								U.S. EPA ID Number TXD988088464				
Facility's Phone: 432-525-9500												
GENERATOR	9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))				10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
						No.	Type					
	1.	Non-Regulated Material				5	BA	20	T	OUTS 3191		
	2.											
	3.											
	4.											
14. Special Handling Instructions and Additional Information WP-019686												
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.												
Generator's/Offor's Printed/Typed Name Daniel Cooper						Signature 		Month Day Year 9 19 12				
INT'L	16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____											
	Transporter signature (for exports only): _____											
TRANSPORTER	17. Transporter Acknowledgment of Receipt of Materials											
	Transporter 1 Printed/Typed Name Robert Reed						Signature 		Month Day Year 09 19 12			
	Transporter 2 Printed/Typed Name						Signature		Month Day Year			
DESIGNATED FACILITY	18. Discrepancy											
	18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection											
	Manifest Reference Number: _____											
	18b. Alternate Facility (or Generator) U.S. EPA ID Number											
	Facility's Phone: _____											
	18c. Signature of Alternate Facility (or Generator) Month Day Year											
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)												
	1. H132		2.		3.		4.					
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a												
Printed/Typed Name Edward L Campbell						Signature 		Month Day Year 9 21 12				

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District		2. Page 1 of 1		3. Emergency Response Phone 724-312-1752		4. Manifest Tracking Number 000288660 GBF			
		5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St. Generator's Phone: 312-742-4287		Generator's Site Address (if different than mailing address) 653 E. North Water St. Chicago, IL 60611							
6. Transporter 1 Company Name SLT Express Way Inc.		U.S. EPA ID Number AZR000508515									
7. Transporter 2 Company Name		U.S. EPA ID Number									
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714 Facility's Phone: 409-636-8500		U.S. EPA ID Number TXD988088464									

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes	
		No.	Type				
1.	Non-Regulated Material	5	BA	20	T	OUTS 3191	
2.							
3.							
4.							

14. Special Handling Instructions and Additional Information
WP-019686

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
 I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offor's Printed/Typed Name Daniel Cooper		Signature 		Month 9	Day 19	Year 12
--	--	---------------	--	-------------------	------------------	-------------------

16. International Shipments ☐ Import to U.S. ☐ Export from U.S.

Port of entry/exit:
 Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name DARREN K. WHITE		Signature 		Month 09	Day 19	Year 12
Transporter 2 Printed/Typed Name		Signature		Month	Day	Year

18. Discrepancy


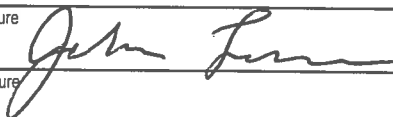
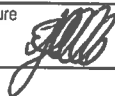
18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection							
Manifest Reference Number:							
18b. Alternate Facility (or Generator) U.S. EPA ID Number							
Facility's Phone:							
18c. Signature of Alternate Facility (or Generator)					Month 9	Day 21	Year 12

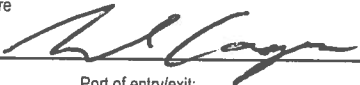


19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. H132	2.	3.	4.
----------------	----	----	----

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name EDUARDO L CAMPBELL		Signature 		Month 9	Day 21	Year 12
---	--	---------------	--	-------------------	------------------	-------------------

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District		2. Page 1 of 1		3. Emergency Response Phone 724-312-1752		4. Manifest Tracking Number 000288661 GBF			
		5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St. Generator's Phone: 312-742-4287		Generator's Site Address (if different than mailing address) 653 E North Water St Chicago, IL 60611							
6. Transporter 1 Company Name SLT Express Way Inc.		U.S. EPA ID Number AZR000508515									
7. Transporter 2 Company Name		U.S. EPA ID Number									
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714		U.S. EPA ID Number TXD988088464									
Facility's Phone: 432-525-9500											
GENERATOR	9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))				10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes	
						No.	Type				
	1.	Non-Regulated Material				5	BA	20	T	OUTS 3191	
	2.										
	3.										
	4.										
14. Special Handling Instructions and Additional Information WP-019686											
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.											
Generator's/Offor's Printed/Typed Name Daniel Cooper											
Signature 											
Month Day Year 9 12 12											
INT'L	16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____										
	Transporter signature (for exports only): _____										
TRANSPORTER	17. Transporter Acknowledgment of Receipt of Materials										
	Transporter 1 Printed/Typed Name John J. Lane										
Signature 											
Month Day Year 09 19 12											
Transporter 2 Printed/Typed Name											
Signature											
Month Day Year											
DESIGNATED FACILITY	18. Discrepancy										
	18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection										
	Manifest Reference Number: _____										
	18b. Alternate Facility (or Generator) U.S. EPA ID Number										
	Facility's Phone: _____										
18c. Signature of Alternate Facility (or Generator)											
Month Day Year											
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)											
1. H132		2.		3.		4.					
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a											
Printed/Typed Name ERMAN L. CAMPBELL											
Signature 											
Month Day Year 9 21 12											

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District	2. Page 1 of 1	3. Emergency Response Phone 724-312-1752	4. Manifest Tracking Number 000288662 GBF		
5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St. Generator's Phone: 312-742-4287				Generator's Site Address (if different than mailing address) 653 E. North Water St. Chicago, IL 60611			
6. Transporter 1 Company Name SLT Exoress Wav Inc.				U.S. EPA ID Number AZR000508515			
7. Transporter 2 Company Name				U.S. EPA ID Number			
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714 Facility's Phone: 409-525-0500				U.S. EPA ID Number TXD988088464			
9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes	
		No.	Type				
1.	Non-Regulated Material	5	BA	20	T	OUTS 3191	
2.							
3.							
4.							
14. Special Handling Instructions and Additional Information WP-019686							
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.							
Generator's/Offor's Printed/Typed Name Daniel Cooper				Signature 		Month Day Year 9 20 12	
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: Date leaving U.S.:							
17. Transporter Acknowledgment of Receipt of Materials							
Transporter 1 Printed/Typed Name Harry McKinster				Signature 		Month Day Year 09 20 12	
Transporter 2 Printed/Typed Name				Signature		Month Day Year	
18. Discrepancy							
18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection							
18b. Alternate Facility (or Generator) Manifest Reference Number: U.S. EPA ID Number							
Facility's Phone:							
18c. Signature of Alternate Facility (or Generator)						Month Day Year	
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)							
1.	2.	3.	4.				
H132							
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a							
Printed/Typed Name EDWARD L CAMPBELL				Signature 		Month Day Year 9 21 12	

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District	2. Page 1 of 1	3. Emergency Response Phone 724-312-1752	4. Manifest Tracking Number 000288663 GBF		
5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St. Chicago, IL 60611			Generator's Site Address (if different than mailing address) 653 E. North Water St. Chicago, IL 60611				
6. Transporter 1 Company Name SLT Express Way Inc.			U.S. EPA ID Number AZR000508515				
7. Transporter 2 Company Name			U.S. EPA ID Number				
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714			U.S. EPA ID Number TXD988088464				
Facility's Phone: 432-626-9600							
GENERATOR	9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers		11. Total Quantity	12. Unit Wt./Vol.	
			No.	Type			
	1.	Non-Regulated Material	48	BA	15 20	PA9D4112 F	OUTS 3191
	2.				24800 LBS	LBS	
	3.						
4.							
14. Special Handling Instructions and Additional Information WP-019686							
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.							
Generator's/Offoror's Printed/Typed Name Daniel Cooper			Signature <i>[Signature]</i>		Month Day Year 7 20 12		
INT'L	16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____						
	Transporter signature (for exports only): _____						
TRANSPORTER	17. Transporter Acknowledgment of Receipt of Materials						
	Transporter 1 Printed/Typed Name LEAH SMITH		Signature <i>[Signature]</i>		Month Day Year 10 20 12		
	Transporter 2 Printed/Typed Name		Signature		Month Day Year		
DESIGNATED FACILITY	18. Discrepancy						
	18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection						
	Manifest Reference Number: _____						
	18b. Alternate Facility (or Generator)			U.S. EPA ID Number			
	Facility's Phone: _____						
	18c. Signature of Alternate Facility (or Generator)					Month Day Year	
	19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)						
	1. H132	2.	3.	4.			
	20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a						
	Printed/Typed Name Phyllis Morrison		Signature <i>[Signature]</i>		Month Day Year 9 24 12		

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator ID Number Chicago Park District		2. Page 1 of 1	3. Emergency Response Phone 724-312-1752	4. Manifest Tracking Number 000288664 GBF			
		5. Generator's Name and Mailing Address Chicago Park District 653 E North Water St. Generator's Phone: 312-742-4287		Generator's Site Address (if different than mailing address) 653 E. North Water St. Chicago, IL 60611					
6. Transporter 1 Company Name SLT Express Way Inc.		U.S. EPA ID Number AZR000508515							
7. Transporter 2 Company Name		U.S. EPA ID Number							
8. Designated Facility Name and Site Address Waste Control Specialists LLC TSD Facility 9998 W State Hwy 176, Andrews, TX 79714 Facility's Phone: 432-626-9500		U.S. EPA ID Number TXD988088464							
GENERATOR	9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any)) 1. Non-Regulated Material			10. Containers		11. Total Quantity 16 20 38200	12. Unit Wt./Vol. PL 412410 F 38200 LBS	13. Waste Codes OUTS 3191
					No.	Type			
14. Special Handling Instructions and Additional Information WP-019686									
15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.									
Generator's/Offoror's Printed/Typed Name Daniel Cooper					Signature [Signature]			Month Day Year 9 20 12	
16. International Shipments <input type="checkbox"/> Import to U.S. <input type="checkbox"/> Export from U.S. Port of entry/exit: _____ Date leaving U.S.: _____									
17. Transporter Acknowledgment of Receipt of Materials									
Transporter 1 Printed/Typed Name William Schubert					Signature [Signature]			Month Day Year 9 20 12	
Transporter 2 Printed/Typed Name					Signature			Month Day Year	
18. Discrepancy									
18a. Discrepancy Indication Space <input type="checkbox"/> Quantity <input type="checkbox"/> Type <input type="checkbox"/> Residue <input type="checkbox"/> Partial Rejection <input type="checkbox"/> Full Rejection									
Manifest Reference Number:									
18b. Alternate Facility (or Generator) U.S. EPA ID Number									
Facility's Phone:									
18c. Signature of Alternate Facility (or Generator)								Month Day Year	
19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)									
1. H132		2.		3.		4.			
20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a									
Printed/Typed Name Phyllis Morrison					Signature [Signature]			Month Day Year 9 24 12	



September 21, 2012

Daniel Cooper
Chicago Park District
541 N Fairbanks Ct
Chicago, IL 60611-3319

Dear Mr. Cooper:

Thank you for selecting Waste Control Specialists LLC as your Treatment, Storage, and Disposal Facility. We value your business and hope to be of future service.

This letter serves as confirmation that we are in receipt of the waste described on the below referenced document(s). Enclosed, please find your signed, original manifest indicating that the waste was received at the Waste Control Specialists LLC's Treatment, Storage and Disposal Facility in Andrews, Texas on September 21, 2012.

WCS is committed to providing a level of customer service unequaled in the industry today. If you have any questions regarding this manifest, please do not hesitate to contact me at (888) 789-2783.

Sincerely,
WASTE CONTROL SPECIALISTS LLC

Lisa S. Berta
Technical Services Project Manager

Enclosure: UHWM Manifest # 000288658GBF
 000288659GBF
 000288660GBF
 000288661GBF
 000288662GBF

Corporate
5430 LBJ Freeway, Ste. 1700
Three Lincoln Centre
Dallas, TX 75240
Ph. 972.715.9800
Fx. 972.448.1419

Facility
P.O. Box 1129
Andrews, TX 79714
Ph. 888.789.2783
Fx. 432.525.8904



Certificate of Disposal

Date of Certificate: September 21, 2012

EPA ID Number TXD988088464

Daniel Cooper
Chicago Park District
541 N Fairbanks Ct
Chicago, IL 60611-3319

Reference:

WCS Profile #: WP-019686
Manifest(s): 000288658GBF
000288659GBF
000288660GBF
000288661GBF
000288662GBF

This is to certify that the waste shipped to WCS on the above mentioned manifest was disposed of on September 21, 2012 in the WCS permitted hazardous waste landfill associated with the EPA ID Number above. Disposal is subject to all applicable permits and regulations.

Sincerely,
WASTE CONTROL SPECIALISTS LLC

Lisa S. Berta
Technical Services Project Manager

Corporate

5430 LBJ Freeway, Ste. 1700
Three Lincoln Centre
Dallas, TX 75240
Ph. 972.715.9800
Fx. 972.448.1419

Facility

P.O. Box 1129
Andrews, TX 79714
Ph. 888.789.2783
Fx. 432.525.8904



September 25, 2012

Daniel Cooper
Chicago Park District
541 N Fairbanks Ct
Chicago, IL 60611-3319

Dear Mr. Cooper:

Thank you for selecting Waste Control Specialists LLC as your Treatment, Storage, and Disposal Facility. We value your business and hope to be of future service.

This letter serves as confirmation that we are in receipt of the waste described on the below referenced document(s). Enclosed, please find your signed, original manifest indicating that the waste was received at the Waste Control Specialists LLC's Treatment, Storage and Disposal Facility in Andrews, Texas on September 24, 2012.

WCS is committed to providing a level of customer service unequaled in the industry today. If you have any questions regarding this manifest, please do not hesitate to contact me at (888) 789-2783.

Sincerely,
WASTE CONTROL SPECIALISTS LLC

Lisa S. Berta
Technical Services Project Manager

Enclosure: UHWM Manifest # 000288663GBF
000288664GBF

Corporate
5430 LBJ Freeway, Ste. 1700
Three Lincoln Centre
Dallas, TX 75240
Ph. 972.715.9800
Fx. 972.448.1419

Facility
P.O. Box 1129
Andrews, TX 79714
Ph. 888.789.2783
Fx. 432.525.8904



Certificate of Disposal

Date of Certificate: September 25, 2012

EPA ID Number TXD988088464

Daniel Cooper
Chicago Park District
541 N Fairbanks Ct
Chicago, IL 60611-3319

Reference:

WCS Profile #: WP-019686
Manifest(s): 000288663GBF
000288664GBF

This is to certify that the waste shipped to WCS on the above mentioned manifest was disposed of on September 24, 2012 in the WCS permitted hazardous waste landfill associated with the EPA ID Number above. Disposal is subject to all applicable permits and regulations.

Sincerely,
WASTE CONTROL SPECIALISTS LLC

Lisa S. Berta
Technical Services Project Manager

Corporate

5430 LBJ Freeway, Ste. 1700
Three Lincoln Centre
Dallas, TX 75240
Ph. 972.715.9800
Fx. 972.448.1419

Facility

P.O. Box 1129
Andrews, TX 79714
Ph. 888.789.2783
Fx. 432.525.8904

ATTACHMENT 1

RADIATION SURVEY FORM

SURVEY REFERENCE #: **061212-2**

DATE OF SURVEY: **June 12, 2012**

NAME OF SURVEYOR: **Glenn Huber**

SURVEY METER IDENTIFICATION:

Mfg: **Bicron**

Background Reading: **4 uRem/hr**

Model: **MicroRem**

Serial: **C258C**

INSTRUMENT ID:

Mfg: **Ludlum**

Background Reading: **0.37 cpm**

Model: **2200 (scaler) / 43-10 (alpha)**

Efficiency: **24.3%**

Serial: **130520 / PR 113195**

MDA: **11.8 dpm**

Description (attached sketch if needed) (Area, equipment, vehicle, materials, etc.)	Item #	Survey Gross uRem	Gross Cpm 2 min Ct / Gross CPM	dpm per 100 sq. cm
Bag #1 – wipe 1		17	1 0.5	<12 dpm
Bag #1 – wipe 2			2 1	<12 dpm
Bag #2		9	2 1	<12 dpm
Bag #2			2 1	<12 dpm
Bag #3		10	1 0.5	<12 dpm
Bag #3			0 0	<12 dpm
Bag #4		9	1 0.5	<12 dpm
Bag #4			0 0	<12 dpm
Bag #5		14	1 0.5	<12 dpm
Bag #5			0 0	<12 dpm
Bag #6		12	0 0	<12 dpm
Bag #6			0 0	<12 dpm
Bag #7		12	1 0.5	<12 dpm
Bag #7			0 0	<12 dpm
Bag #8		18	0 0	<12 dpm
Bag #8			1 0.5	<12 dpm
Bag #9		8	1 0.5	<12 dpm
Bag #9			0 0	<12 dpm
Bag #10		9	0 0	<12 dpm
Bag #10			0 0	<12 dpm

ATTACHMENT 1

RADIATION SURVEY FORM

SURVEY REFERENCE #: **061212-3**

DATE OF SURVEY: **June 12, 2012**

NAME OF SURVEYOR: **Glenn Huber**

SURVEY METER IDENTIFICATION:

Mfg: **Bicron**

Background Reading: **4 uRem/hr**

Model: **MicroRem**

Serial: **C258C**

INSTRUMENT ID:

Mfg: **Ludlum**

Background Reading: **0.37 cpm**

Model: **2200 (scaler) / 43-10 (alpha)**

Efficiency: **24.3%**

Serial: **130520 / PR 113195**

MDA: **11.8 dpm**

Description (attached sketch if needed) (Area, equipment, vehicle, materials, etc.)	Item #	Survey Gross uRem	Gross Cpm <small>2 min Ct / Gross CPM</small>		dpm per 100 sq. cm
Bag #11		12	0	0	<12 dpm
Bag #11			1	0.5	<12 dpm
Bag #12		10	3	1.5	<12 dpm
Bag #12			0	0	<12 dpm
Bag #13		8	1	0.5	<12 dpm
Bag #13			0	0	<12 dpm
Bag #14		8	0	0	<12 dpm
Bag #14			0	0	<12 dpm
Bag #15		17	0	0	<12 dpm
Bag #15			0	0	<12 dpm
Bag #16		12	1	0.5	<12 dpm
Bag #16			1	0.5	<12 dpm
Bag #17		17	0	0	<12 dpm
Bag #17			1	0.5	<12 dpm
Bag #18		17	1	0.5	<12 dpm
Bag #18			2	1	<12 dpm
Bag #19		12	1	0.5	<12 dpm
Bag #19			0	0	<12 dpm
Bag #20		16	0	0	<12 dpm
Bag #20			0	0	<12 dpm

ATTACHMENT 1

RADIATION SURVEY FORM

SURVEY REFERENCE #: **061212-4**

DATE OF SURVEY: **June 12, 2012**

NAME OF SURVEYOR: **Glenn Huber**

SURVEY METER IDENTIFICATION:

Mfg: **Bicron**

Background Reading: **4 uRem/hr**

Model: **MicroRem**

Serial: **C258C**

INSTRUMENT ID:

Mfg: **Ludlum**

Background Reading: **0.37 cpm**

Model: **2200 (scaler) / 43-10 (alpha)**

Efficiency: **24.3%**

Serial: **130520 / PR 113195**

MDA: **11.8 dpm**

Description (attached sketch if needed) (Area, equipment, vehicle, materials, etc.)	Item #	Survey Gross uRem	Gross Cpm <small>2 min Ct / Gross CPM</small>		dpm per 100 sq. cm
Bag #21		18	0	0	<12 dpm
Bag #21			0	0	<12 dpm
Bag #22		12	1	0.5	<12 dpm
Bag #22			0	0	<12 dpm
Bag #23		18	1	0.5	<12 dpm
Bag #23			0	0	<12 dpm
Bag #24		18	0	0	<12 dpm
Bag #24			0	0	<12 dpm
Bag #25		40	2	1	<12 dpm
Bag #25			0	0	<12 dpm
Bag #26		18	0	0	<12 dpm
Bag #26			0	0	<12 dpm
Bag #27		14	4	2	<12 dpm
Bag #27			0	0	<12 dpm
Bag #28		12	0	0	<12 dpm
Bag #28			0	0	<12 dpm
Bag #29		12	0	0	<12 dpm
Bag #29			0	0	<12 dpm
Bag #30		17	0	0	<12 dpm
Bag #30			0	0	<12 dpm

RADIATION SURVEY FORM

[illegible]

Appendix G

Equipment Release Survey Results

RADIATION SURVEY FORM

[illegible]

Appendix H

Air Monitoring Results

H-1 Perimeter Air Monitoring

H-2 Personal Air Monitoring

Appendix H-1

Perimeter Air Monitoring

Area Air Monitoring Summary Sheet - Weekly Effluent Concentration Report

DuSable Park June 2012 - AECOM

North Monitor

Report #1 6/4/12 - 6/12/12

(High Volume)

Date	Time Sampled (minutes)	Effluent Concentration in uCi/ml	Concentration x Sample Min / Day	Comments
6/4/2012	295	0.00E+00	0.00E+00	
6/5/2012	382	0.00E+00	0.00E+00	
6/6/2012	340	0.00E+00	0.00E+00	
6/7/2012	380	0.00E+00	0.00E+00	
6/8/2012	370	0.00E+00	0.00E+00	
6/11/2012	370	0.00E+00	0.00E+00	
6/12/2012	125	2.85E-15	3.56E-13	
2262		2.85E-15	3.56E-13	

$$C_{avg} = \frac{\sum T_{s,i} C_i}{\sum T_s}$$

Eq A.9 NUREG 1400

Time Weighted Weekly

Effluent Concentration (North) = 1.57E-16 uCi/ml

Percentage of Release Limit of = 3.94%
4E-15uCi/ml Th-232

South Monitor

Date	Time Sampled (minutes)	Effluent Concentration in uCi/ml	Concentration x Sample Min / Day	Comments
6/4/2012	295	2.55E-15	7.52E-13	
6/5/2012	380	8.52E-16	3.24E-13	
6/6/2012	337	1.06E-15	3.57E-13	
6/7/2012	385	0.00E+00	0.00E+00	
6/8/2012	380	8.11E-16	3.08E-13	
6/11/2012	368	0.00E+00	0.00E+00	
6/12/2012	132	0.00E+00	0.00E+00	
2277		5.27E-15	1.74E-12	

$$C_{avg} = \frac{\sum T_{s,i} C_i}{\sum T_s}$$

Eq A.9 NUREG 1400

Time Weighted Weekly

Effluent Concentration (South) = 7.65E-16 uCi/ml

Percentage of Release Limit of = 19.12%
4E-15uCi/ml Th-232

East Monitor

Date	Time Sampled (minutes)	Effluent Concentration in uCi/ml	Concentration x Sample Min / Day	Comments
6/4/2012	300	0.00E+00	0.00E+00	
6/5/2012	383	0.00E+00	0.00E+00	
6/6/2012	345	2.01E-15	6.93E-13	
6/7/2012	377	8.59E-16	0.00E+00	
6/8/2012	367	0.00E+00	0.00E+00	
6/11/2012	362	1.99E-15	7.20E-13	
6/12/2012	131	0.00E+00	0.00E+00	
2265		4.86E-15	1.41E-12	

$$C_{avg} = \frac{\sum T_{s,i} C_i}{\sum T_s}$$

Eq A.9 NUREG 1400

Time Weighted Weekly

Effluent Concentration (East) = 6.24E-16 uCi/ml

Percentage of Release Limit of = 15.61%
4E-15uCi/ml Th-232

West Monitor

Date	Time Sampled (minutes)	Effluent Concentration in uCi/ml	Concentration x Sample Min / Day	Comments
6/4/2012	290	0.00E+00	0.00E+00	
6/5/2012	380	0.00E+00	0.00E+00	
6/6/2012	344	8.78E-17	3.02E-14	
6/7/2012	380	0.00E+00	0.00E+00	
6/8/2012	368	8.71E-16	3.21E-13	
6/11/2012	368	1.74E-15	6.40E-13	
6/12/2012	127	0.00E+00	0.00E+00	
2257		2.70E-15	9.91E-13	

$$C_{avg} = \frac{\sum T_{s,i} C_i}{\sum T_s}$$

Eq A.9 NUREG 1400

Time Weighted Weekly	
Effluent Concentration (West) =	4.39E-16 uCi/ml
<i>Percentage of Release Limit of =</i>	<i>10.98%</i>
<i>4E-15uCi/ml Th-232</i>	

Area Air Monitoring Summary Sheet - Staplex High Volume Pumps (Daily Analysis)

DuSable Park, Chicago, IL AECOM

Report No. 1 Monday June 4, 2012 - Friday June 8, 2012

Sample ID	date sampled	total time sampled	cubic ft/ min (CFM)	sample volume analyzed	day after analysis							four day analysis							% of Limit	
					date analyzed	gross counts	gross cpm	bkg cpm	net cpm	eff	Concentration in uCi/ml	date analyzed	gross counts	gross cpm	bkg cpm	net cpm	eff	Concentration in uCi/ml	4.00E-15	Th-232 uCi/ml
N001	6/4/12	295	52	1.52E+07	06/05/12	25	0.83	0.47	0.36	0.243	1.27E-14	06/08/12	9	0.30	0.37	0.00	0.243	0.00E+00	0.00%	
S001	6/4/12	295	45	1.32E+07	06/05/12	23	0.77	0.47	0.30	0.243	1.19E-14	06/08/12	13	0.43	0.37	0.06	0.243	2.55E-15	63.74%	
E001	6/4/12	300	51	1.52E+07	06/05/12	21	0.70	0.47	0.23	0.243	8.03E-15	06/08/12	7	0.23	0.37	0.00	0.243	0.00E+00	0.00%	
W001	6/4/12	290	56	1.61E+07	06/05/12	13	0.43	0.47	0.00	0.243	0.00E+00	06/08/12	11	0.37	0.37	0.00	0.243	0.00E+00	0.00%	
N002	6/5/12	382	50	1.89E+07	06/06/12	43	1.43	0.47	0.96	0.243	2.70E-14	06/10/12	10	0.33	0.4	0.00	0.243	0.00E+00	0.00%	
S002	6/5/12	380	55	2.07E+07	06/06/12	34	1.13	0.47	0.66	0.243	1.70E-14	06/10/12	13	0.43	0.4	0.03	0.243	8.52E-16	21.31%	
E002	6/5/12	383	56	2.13E+07	06/06/12	18	0.60	0.47	0.13	0.243	3.24E-15	06/10/12	12	0.40	0.4	0.00	0.243	0.00E+00	0.00%	
W002	6/5/12	380	56	2.11E+07	06/06/12	35	1.17	0.47	0.70	0.243	1.75E-14	06/10/12	7	0.23	0.4	0.00	0.243	0.00E+00	0.00%	
N003	6/6/12	340	56	1.89E+07	06/07/12	27	0.90	0.3	0.60	0.243	1.68E-14	06/11/12	9	0.30	0.33	0.00	0.243	0.00E+00	0.00%	
S003	6/6/12	337	55	1.84E+07	06/07/12	24	0.80	0.3	0.50	0.243	1.44E-14	06/11/12	11	0.37	0.33	0.04	0.243	1.06E-15	26.43%	
E003	6/6/12	345	54	1.85E+07	06/07/12	17	0.57	0.3	0.27	0.243	7.65E-15	06/11/12	12	0.40	0.33	0.07	0.243	2.01E-15	50.20%	
W003	6/6/12	344	59	2.01E+07	06/07/12	18	0.60	0.3	0.30	0.243	7.90E-15	06/11/12	10	0.33	0.33	0.00	0.243	8.78E-17	2.19%	
N004	6/7/12	380	60	2.26E+07	06/08/12	44	1.47	0.37	1.10	0.243	2.57E-14	06/12/12	11	0.37	0.4	0.00	0.243	0.00E+00	0.00%	
S004	6/7/12	385	52	1.98E+07	06/08/12	48	1.60	0.37	1.23	0.243	3.28E-14	06/12/12	9	0.30	0.4	0.00	0.243	0.00E+00	0.00%	
E004	6/7/12	377	55	2.05E+07	06/08/12	36	1.20	0.37	0.83	0.243	2.14E-14	06/12/12	13	0.43	0.4	0.03	0.243	8.59E-16	21.48%	
W004	6/7/12	380	52	1.96E+07	06/08/12	28	0.93	0.37	0.56	0.243	1.52E-14	06/12/12	10	0.33	0.4	0.00	0.243	0.00E+00	0.00%	
N005	6/8/12	370	50	1.83E+07	06/11/12	15	0.50	0.33	0.17	0.243	4.91E-15	06/13/12	11	0.37	0.37	0.00	0.243	0.00E+00	0.00%	
S005	6/8/12	380	52	1.96E+07	06/11/12	12	0.40	0.33	0.07	0.243	1.89E-15	06/13/12	12	0.40	0.37	0.03	0.243	8.11E-16	20.28%	
E005	6/8/12	367	53	1.93E+07	06/11/12	14	0.47	0.33	0.14	0.243	3.75E-15	06/13/12	8	0.27	0.37	0.00	0.243	0.00E+00	0.00%	
W005	6/8/12	368	50	1.82E+07	06/11/12	17	0.57	0.33	0.24	0.243	6.87E-15	06/13/12	12	0.40	0.37	0.03	0.243	8.71E-16	21.78%	

Area Air Monitoring Summary Sheet - Staplex High Volume Pumps (Daily Analysis)

DuSable Park, Chicago, IL AECOM

Report No. 2 Monday June 11, 2012 - Tuesday June 12, 2012

Sample ID	date sampled	total time sampled	cubic ft/ min (CFM)	sample volume analyzed	day after analysis							four day analysis							% of Limit	
					date analyzed	gross counts	gross cpm	bkg cpm	net cpm	eff	Concentration in uCi/ml	date analyzed	gross counts	gross cpm	bkg cpm	net cpm	eff	Concentration in uCi/ml	4.00E-15 Th-232 uCi/ml	
N006	6/11/12	370	56	2.05E+07	06/12/12	117	3.90	0.4	3.50	0.243	9.03E-14	06/15/12	11	0.37	0.47	0.00	0.243	0.00E+00	0.00%	
S006	6/11/12	368	49	1.79E+07	06/12/12	253	8.43	0.4	8.03	0.243	2.38E-13	06/15/12	14	0.47	0.47	0.00	0.243	0.00E+00	0.00%	
E006	6/11/12	362	47	1.69E+07	06/12/12	119	3.97	0.4	3.57	0.243	1.12E-13	06/15/12	16	0.53	0.47	0.06	0.243	1.99E-15	49.73%	
W006	6/11/12	368	53	1.93E+07	06/12/12	157	5.23	0.4	4.83	0.243	1.32E-13	06/15/12	16	0.53	0.47	0.06	0.243	1.74E-15	43.38%	
N007	6/12/12	125	55	6.81E+06	06/13/13	29	0.97	0.37	0.60	0.243	4.64E-14	06/18/12	14	0.47	0.43	0.04	0.243	2.85E-15	71.25%	
S007	6/12/12	132	55	7.20E+06	06/13/13	38	1.27	0.37	0.90	0.243	6.60E-14	06/18/12	10	0.33	0.43	0.00	0.243	0.00E+00	0.00%	
E007	6/12/12	131	57	7.40E+06	06/13/13	35	1.17	0.37	0.80	0.243	5.70E-14	06/18/12	12	0.40	0.43	0.00	0.243	0.00E+00	0.00%	
W007	6/12/12	127	57	7.17E+06	06/13/13	30	1.00	0.37	0.63	0.243	4.65E-14	06/18/23	12	0.40	0.43	0.00	0.243	0.00E+00	0.00%	

FORM SOP 212-10
RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)

Multiply Cubic Feet by 28.316 to Obtain Liters

ML/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N001	GAH	6/4/12	9:45A	2:40P	295	52	0.035	1.52×10^7
S001	GAH	6/4/12	9:40A	2:35P	295	45	0.035	1.32×10^7
E001	GAH	6/4/12	9:40A	2:40P	300	51	0.035	1.52×10^7
W001	GAH	6/4/12	9:45A	2:35P	290	56	0.035	1.61×10^7

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) =
$$\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N001	GAH	6/5/12	25	0.36	0.243	1.52×10^7	1.25×10^{-14}		
S001	GAH	6/5/12	23	0.30	0.243	1.32×10^7	1.20×10^{-14}		
E001	GAH	6/5/12	21	0.23	0.243	1.52×10^7	8.01×10^{-15}		
W001	GAH	6/5/12	13	0	0.243	1.61×10^7	0		
4 day analysis									
N001	GAH	6/8/12	9	0	0.243	1.52×10^7	0		
S001	GAH	6/8/12	13	0.06	0.243	1.32×10^7	2.54×10^{-15}		
E001	GAH	6/8/12	7	0	0.243	1.52×10^7	0		
W001	GAH	6/8/12	11	0	0.243	1.61×10^7	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/5/12 is 14 $\frac{\text{counts}}{\text{epm}} / 30 \text{ min} = 0.47 \text{ cpm}$
 date

30 minute background count for 6/8/12 is 11 $\frac{\text{counts}}{\text{epm}} / 30 \text{ min} = 0.37 \text{ cpm}$
 date

FORM SOP 212-10
RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)
 Multiply Cubic Feet by 28.316 to Obtain Liters
 Ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N002	GAH	6/5/12	8:45A	3:07P	382	50	0.035	1.89×10^7
S002	GAH	6/5/12	8:50A	3:10P	380	55	0.035	2.07×10^7
E002	GAH	6/5/12	8:45A	3:08P	383	56	0.035	2.13×10^7
W002	GAH	6/5/12	8:50A	3:10P	380	56	0.035	2.11×10^7

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) =
$$\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N002	GAH	6/6/12	43	0.96	0.243	1.89×10^7	2.70×10^{-14}		
S002	GAH	6/6/12	34	0.66	0.243	2.07×10^7	1.70×10^{-14}		
E002	GAH	6/6/12	18	0.13	0.243	2.13×10^7	3.23×10^{-14}		
W002	GAH	6/6/12	35	0.70	0.243	2.11×10^7	1.74×10^{-14}		
4 day analysis									
N002	GAH	6/10/12	10	0	0.243	1.89×10^7	0		
S002	GAH	6/10/12	13	0.03	0.243	2.07×10^7	8.52×10^{-16}		
E002	GAH	6/10/12	12	0	0.243	2.13×10^7	0		
W002	GAH	6/10/12	7	0	0.243	2.11×10^7	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/6/12 is 14 $\frac{\text{cts}}{\text{min}}$ / 30 min = 0.47 cpm
 date

30 minute background count for 6/10/12 is 12 $\frac{\text{cts}}{\text{min}}$ / 30 min = 0.40 cpm
 date

FORM SOP 212-10
RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)
 Multiply Cubic Feet by 28.316 to Obtain Liters
 ML/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N003	GAH	6/6/12	8:50A	2:30P	340	56	0.035	1.89×10^7
S003	GAH	6/6/12	8:55A	2:32P	337	55	0.035	1.84×10^7
E003	GAH	6/6/12	8:55A	2:40P	345	54	0.035	1.85×10^7
W003	GAH	6/6/12	8:50A	2:34P	344	59	0.035	2.01×10^7

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) =
$$\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N003	GAH	6/7/12	27	0.60	0.243	1.89×10^7	1.68×10^{-14}		
S003	GAH	6/7/12	24	0.50	0.243	1.84×10^7	1.44×10^{-14}		
E003	GAH	6/7/12	17	0.27	0.243	1.85×10^7	7.65×10^{-15}		
W003	GAH	6/7/12	18	0.30	0.243	2.01×10^7	7.90×10^{-15}		
4 day analysis									
N003	GAH	6/11/12	9	0	0.243	1.89×10^7	0		
S003	GAH	6/11/12	11	0.04	0.243	1.84×10^7	1.05×10^{-15}		
E003	GAH	6/11/12	12	0.07	0.243	1.85×10^7	2.01×10^{-15}		
W003	GAH	6/11/12	10	0	0.243	2.01×10^7	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/7/12 is 9 $\frac{\text{cpm}}{30 \text{ min.}}$ = 0.30 cpm
 date

30 minute background count for 6/11/12 is 10 $\frac{\text{cpm}}{30 \text{ min.}}$ = 0.33 cpm
 date

FORM SOP 212-10 **RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS**

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)

Multiply Cubic Feet by 28.316 to Obtain Liters

ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N004	GAH	6/7/12	8:25A	2:45P	380	60	0.035	2.26×10^7
S004	GAH	6/7/12	8:20A	2:45P	385	52	0.035	1.98×10^7
E004	GAH	6/7/12	8:25A	2:42P	377	55	0.035	2.05×10^7
W004	GAH	6/7/12	8:20A	2:40P	380	52	0.035	1.96×10^7

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) =
$$\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N004	GAH	6/8/12	44	1.10	0.243	2.26×10^7	2.57×10^{-14}		
S004	GAH	6/8/12	38	1.23	0.243	1.98×10^7	3.28×10^{-14}		
E004	GAH	6/8/12	36	0.83	0.243	2.05×10^7	2.14×10^{-14}		
W004	GAH	6/8/12	28	0.56	0.243	1.96×10^7	1.52×10^{-14}		
4 day analysis									
N004	GAH	6/12/12	11	0	0.243	2.26×10^7	0		
S004	GAH	6/12/12	9	0	0.243	1.98×10^7	0		
E004	GAH	6/12/12	13	0.03	0.243	2.05×10^7	8.61×10^{-16}		
W004	GAH	6/12/12	10	0	0.243	1.96×10^7	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/8/12 is 11 $\frac{\text{cpm}}{30 \text{ min}}$ = 0.37 cpm
 date

30 minute background count for 6/12/12 is 12 $\frac{\text{cpm}}{30 \text{ min}}$ = 0.40 cpm
 date

FORM SOP 212-10
RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)
 Multiply Cubic Feet by 28.316 to Obtain Liters
 Ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N005	GAH	6/8/12	8:22A	2:32P	370	50	0.035	1.83×10^3
S005	GAH	6/8/12	8:20A	2:50P	380	52	0.075	1.96×10^3
E005	GAH	6/8/12	8:25A	2:32P	367	53	0.035	1.93×10^3
W005	GAH	6/8/12	8:22A	2:30P	368	50	0.035	1.82×10^3

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) =
$$\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N005	GAH	6/11/12	15	0.17	0.243	1.83×10^3	4.91×10^{-15}		
S005	GAH	6/11/12	12	0.07	0.243	1.96×10^3	1.89×10^{-15}		
E005	GAH	6/11/12	14	0.14	0.243	1.93×10^3	3.25×10^{-14}		
W005	GAH	6/11/12	17	0.24	0.243	1.82×10^3	6.87×10^{-15}		
4 day analysis									
N005	GAH	6/13/12	11	0	0.243	1.83×10^3	0		
S005	GAH	6/13/12	12	0.03	0.243	1.96×10^3	8.10×10^{-16}		
E005	GAH	6/13/12	8	0	0.243	1.93×10^3	0		
W005	GAH	6/13/12	12	0.03	0.243	1.82×10^3	8.71×10^{-16}		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/11/12 is 10 $\frac{\text{cts}}{\text{cpm}/30\text{min}} = 0.33 \text{ cpm}$
 date

30 minute background count for 6/13/12 is 11 $\frac{\text{cts}}{\text{cpm}/30\text{min}} = 0.37 \text{ cpm}$
 date

FORM SOP 212-10
RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)
 Multiply Cubic Feet by 28.316 to Obtain Liters
 Ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N006	GAH	6/11/12	8:40A	2:50P	370	56	0.035	2.05×10^3
S006	GAH	6/11/12	8:40A	2:48P	368	49	0.035	1.79×10^3
E006	GAH	6/11/12	8:42A	2:48P	362	47	0.035	1.69×10^3
W006	GAH	6/11/12	8:44A	2:50P	368	53	0.035	1.93×10^3

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) =
$$\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N006	GAH	6/12/12	117	3.50	0.243	2.05×10^3	9.03×10^{-14}		
S006	GAH	6/12/12	253	8.03	0.243	1.79×10^3	2.38×10^{-13}		
E006	GAH	6/12/12	119	3.57	0.243	1.69×10^3	1.12×10^{-13}		
W006	GAH	6/12/12	157	4.83	0.243	1.93×10^3	1.32×10^{-13}		
4 day analysis									
N006	GAH	6/15/12	11	0	0.243	2.05×10^3	0		
S006	GAH	6/15/12	14	0	0.243	1.79×10^3	0		
E006	GAH	6/15/12	16	0.06	0.243	1.69×10^3	1.99×10^{-15}		
W006	GAH	6/15/12	16	0.06	0.243	1.93×10^3	1.74×10^{-15}		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/12/12 is 12 $\frac{\text{cts}}{\text{cpm}} / 30 = 0.4 \text{ sp-}$
 date

30 minute background count for 6/15/12 is 14 $\frac{\text{cts}}{\text{cpm}} / 30 = 0.47 \text{ sp-}$
 date

FORM SOP 212-10
RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time)(count/sample conversion)

Multiply Cubic Feet by 28.316 to Obtain Liters

ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)
N007	GAH	6/12/12	8:45A	10:50A	125	55	0.015	6.81×10^6
S007	GAH	6/12/12	8:42A	10:54A	132	55	0.015	7.20×10^6
E007	GAH	6/12/12	8:42A	10:53A	131	57	0.015	7.40×10^6
W007	GAH	6/12/12	8:45A	10:50A	127	57	0.015	7.17×10^6

Equation: Actual Activity = Activity (A) - Background (B)

Activity (A) = $\frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$

SAMPLE ANALYSIS

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
N007	GAH	6/12/12	29	0.60	0.243	6.81×10^6	4.64×10^{-14}		
S007	GAH	6/12/12	38	0.90	0.243	7.20×10^6	6.60×10^{-14}		
E007	GAH	6/12/12	35	0.80	0.243	7.40×10^6	5.70×10^{-14}		
W007	GAH	6/12/12	30	0.63	0.243	7.17×10^6	4.65×10^{-14}		
4 day analysis									
N007	GAH	6/18/12	14	0.04	0.243	6.81×10^6	2.85×10^{-15}		
S007	GAH	6/18/12	10	0	0.243	7.20×10^6	0		
E007	GAH	6/18/12	12	0	0.243	7.40×10^6	0		
W007	GAH	6/18/12	12	0	0.243	7.17×10^6	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
 = 1.0 for 37mm PAM membrane filters

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for 6/13/12 is 11 $\frac{\text{cpm}}{30\text{min}} = 0.37 \text{cpm}$
 date

30 minute background count for 6/18/12 is 13 $\frac{\text{cpm}}{30\text{min}} = 0.43 \text{cpm}$
 date

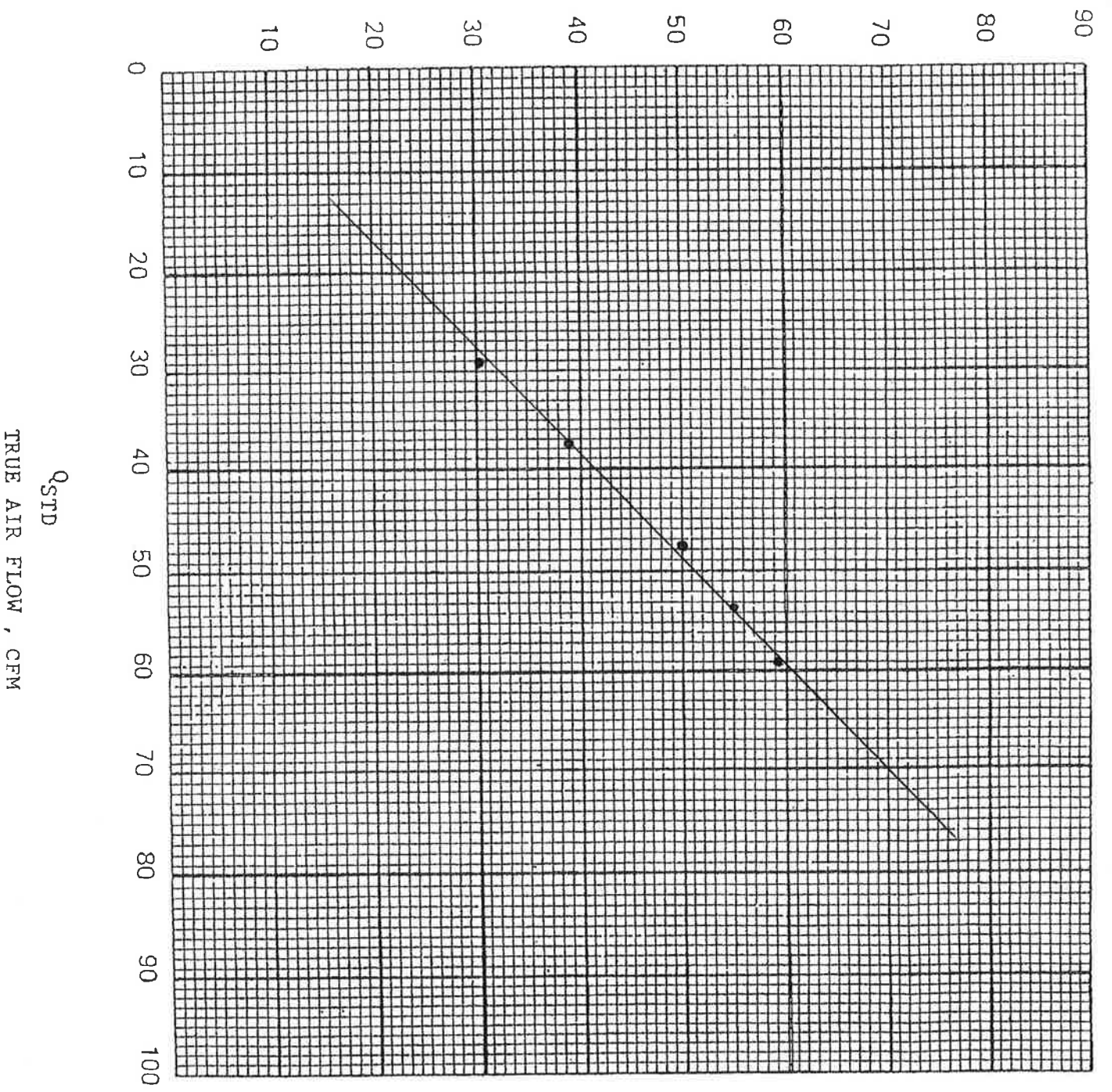
	ΔH " H_2O "	$\sqrt{\Delta H(P_2/P_{STD})(T_{STD}/T_2)}$	Q_{STD} TRUE AIR FLOW cfm	I cm	I. $\sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$ OBSERVED FLOW METER READING
1	11.4	3.47	1.67	58	59.6
2	9.3	3.14	1.51	55	55.0
3	7.4	2.80	1.35	49	50.4
4	4.6	2.21	1.06	38	39.1
5	2.8	1.72	0.82	30	30.9
6					
7					
8					

** Cor. Coef. is sometimes given as r2 as a conventional indicator of linearity

714) 768-3333
Fax: 714-855-0750
e-mail: info@stapco.com
www.stapco.com

$$I \cdot \sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$$

OBSERVED FLOW METER READING , CFM



#21357P
6/30/11 GAH

High Volume Air Sampler Calibration Worksheet

	ΔH H ₂ O	$\sqrt{\Delta H(P_2/P_{STD})(T_{STD}/T_2)}$	Q _{STD} TRUE AIR FLOW m ³ /min	I cm	I · $\sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$ OBSERVED FLOW METER READING	
1	12.6	3.65	1.76	62.22	60	61.7
2	10.0	3.25	1.57	55.30	54	55.5
3	7.7	2.85	1.37	48.41	49	50.4
4	4.9	2.28	1.09	38.66	37	38.1
5	3.0	1.78	0.85	30.01	28	28.8
6						
7						
8						

**
Cor. Coef. is sometimes
given as r² as a convention
indicator of linearity

** Cor. Coef. is sometimes given as r² as a conventional indicator of linearity

Note: Your exact numbers will vary depending on the microprocessor in the computer or scientific calculator you use.

Orifice Calibrator Std slope M₁ = 2.0535

Intercept b₁ = 0.0315

Cor. coef. r₁ = 0.99996

Barometric Pressure: 31.6

"Hg ; convert "Hg x 2.54cm/in. x 10 mm/cm = mmHg

= 802.6 mmHg = P₂

Ambient Temperature: > 6

° F ; convert ° F - 32 x 5 / 9 = ° C + 273.16 = ° K

= 297.6 ° K = T₂

Flow meter observed readings:

* Orifice Calibrator Serial No. 34MX

Hi-Vol Sampler No. 222478

Date

6/30/11

m₂ =

b₂ =

TFA810

62 CFM

4/8 x 10

www.staplex.com

SPECIAL NOTES: T₂ =

T₂ =

AXI

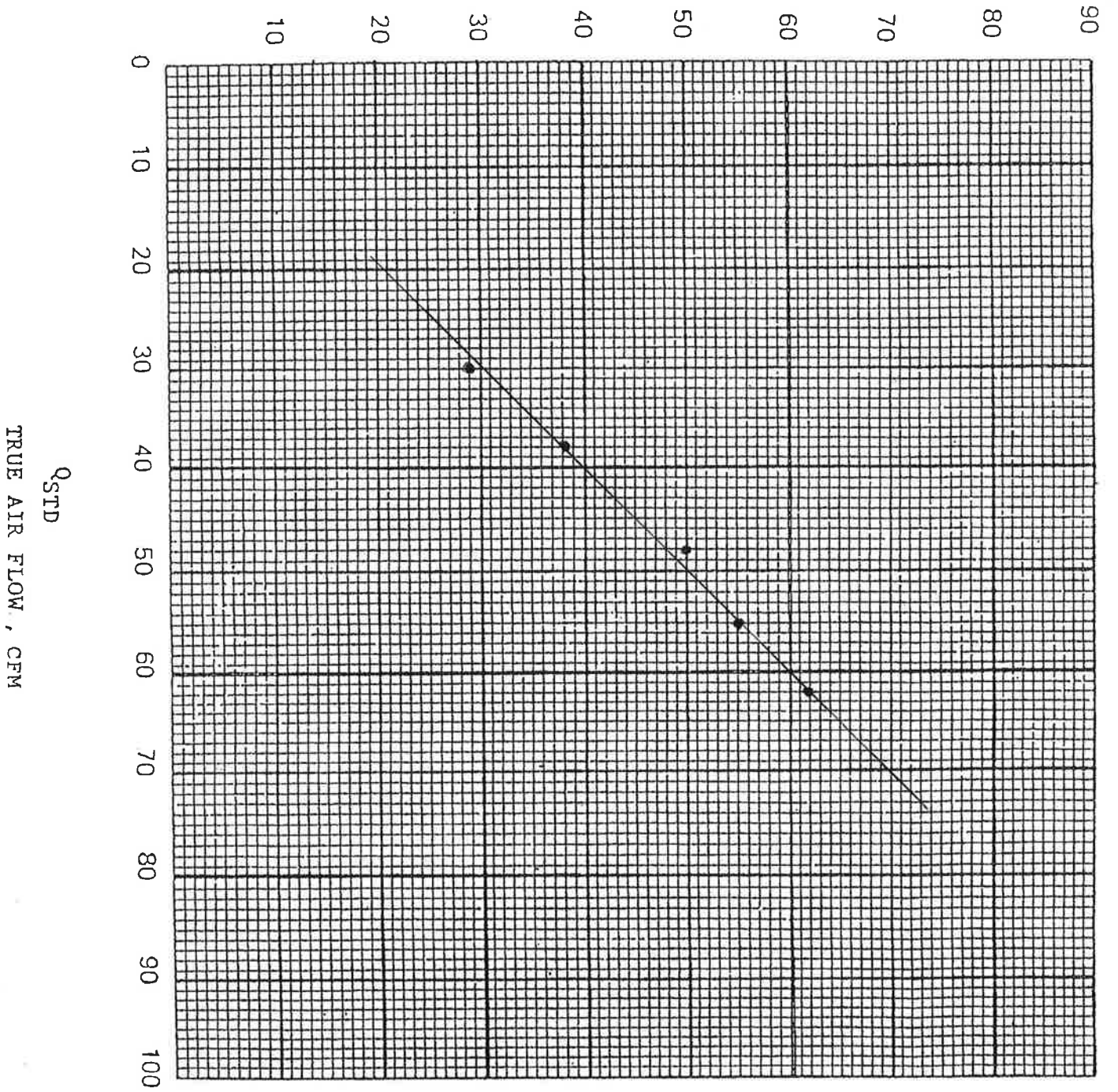
7191 768-3333

Fax: 719-565-0750

email: info@staplex.com

$$I = \sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$$

OBSERVED FLOW METER READING , CFM



22247 P
6/30/11 GAH

High Volume Air Sampler Calibration Worksheet

	ΔH "H ₂ O	$\sqrt{\Delta H(P_2/P_{STD})(T_{STD}/T_2)}$	Q_{STD} TRUE AIR FLOW m ³ /min cfm	I	$I \cdot \sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$ OBSERVED FLOW METER READING	
1	10.6	3.35	1.62	57.1	56	57.6
2	8.8	3.05	1.47	51.9	52	53.5
3	6.8	2.68	1.29	45.5	46	47.3
4	4.2	2.11	1.01	35.7	37	38.1
5	2.7	1.69	0.81	28.6	31	31.9
6						
7						
8						

**
Cor. Coef. is sometimes
given as r² as a conventional
indicator of linearity

** Cor. Coef. is sometimes given as r₂ as a conventional indicator of linearity

Note: Your exact numbers will vary depending on the microprocessor in the computer or scientific calculator you use.

** r₁² = 0.99992
Cor. coef. r₁ = 0.99996

Orifice Calibrator Qstd slope $M_1 = 2.0535$

Intercept $b_1 = 0.0315$

Barometric Pressure: 31.6 "Hg ; convert "Hg x 2.54cm/in. x 10 mm/cm = mmHg

= 822.6 mmHg = P₂

Ambient Temperature: 76 °F ; convert °F - 32 x 5 / 9 = °C + 273.16 = °K

= 297.6 °K = T₂

* Orifice Calibrator Serial No. 34MX

Hi-Vol Sampler No. 239618

Date 6/30/11

SPECIAL NOTES: m₂ = b₂ =

r₂ =

TFP "41"
TFP "2133"
TFP "S"

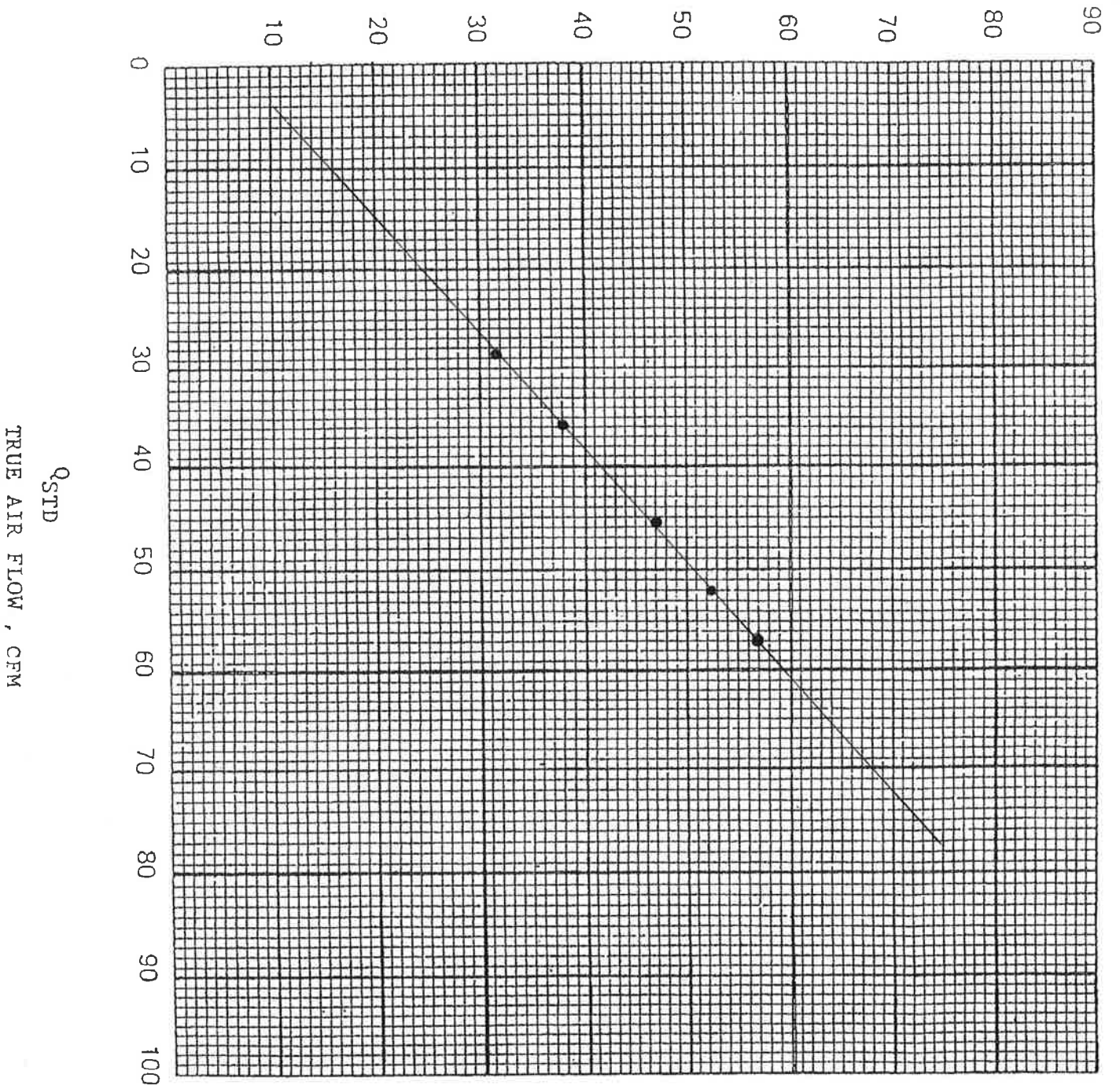
AKI
TFP810

59 cfm
~18x10
F.H. paper

714/768-3333
Fax 714-965-0760
e-mail: info@steph.com
www.steph.com

$$I \cdot \sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$$

OBSERVED FLOW METER READING , CFM



#23961R
6/30/11 GAH

High Volume Air Sampler Calibration Worksheet

ΔH "H ₂ O	$\sqrt{\Delta H(P_2/P_{STD})(T_{STD}/T_2)}$	Q_{STD} TRUE AIR FLOW m ³ /hr cm	I cm	$I \cdot \sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$ OBSERVED FLOW METER READING
1	11.0	3.41	1.65	58.1
2	9.2	3.12	1.50	53.1
3	7.3	2.78	1.34	47.2
4	4.6	2.21	1.06	37.5
5	2.8	1.72	0.82	29.0
6				
7				
8				

** Cor. Coef. is sometimes given as r² as a conventional indicator of linearity

Note: Your exact numbers will vary depending on the microprocessor in the computer or scientific calculator you use.

Orifice Calibrator std slope $m_1 = 2.0535$ intercept $b_1 = 0.0315$ Cor. coef. $r_1 = 0.99996$

Barometric Pressure: 31.6 "Hg ; convert "Hg x 2.54cm/in. x 10 mm/cm = mmHg

= 802.6 mmHg = P_2

Ambient Temperature: 76 °F ; convert °F - 32 x 5 / 9 = °C + 273.16 = °K

= 297.6 °K = T_2

* Orifice Calibrator Serial No. 34MX

Hi-Vol Sampler No. 22097P

Date 6/30/11

SPECIAL NOTES: $m_2 =$ $b_2 =$

$r_2 =$

Flow meter observed readings:

TFA "41"
TFA "2133"
TFA "S"

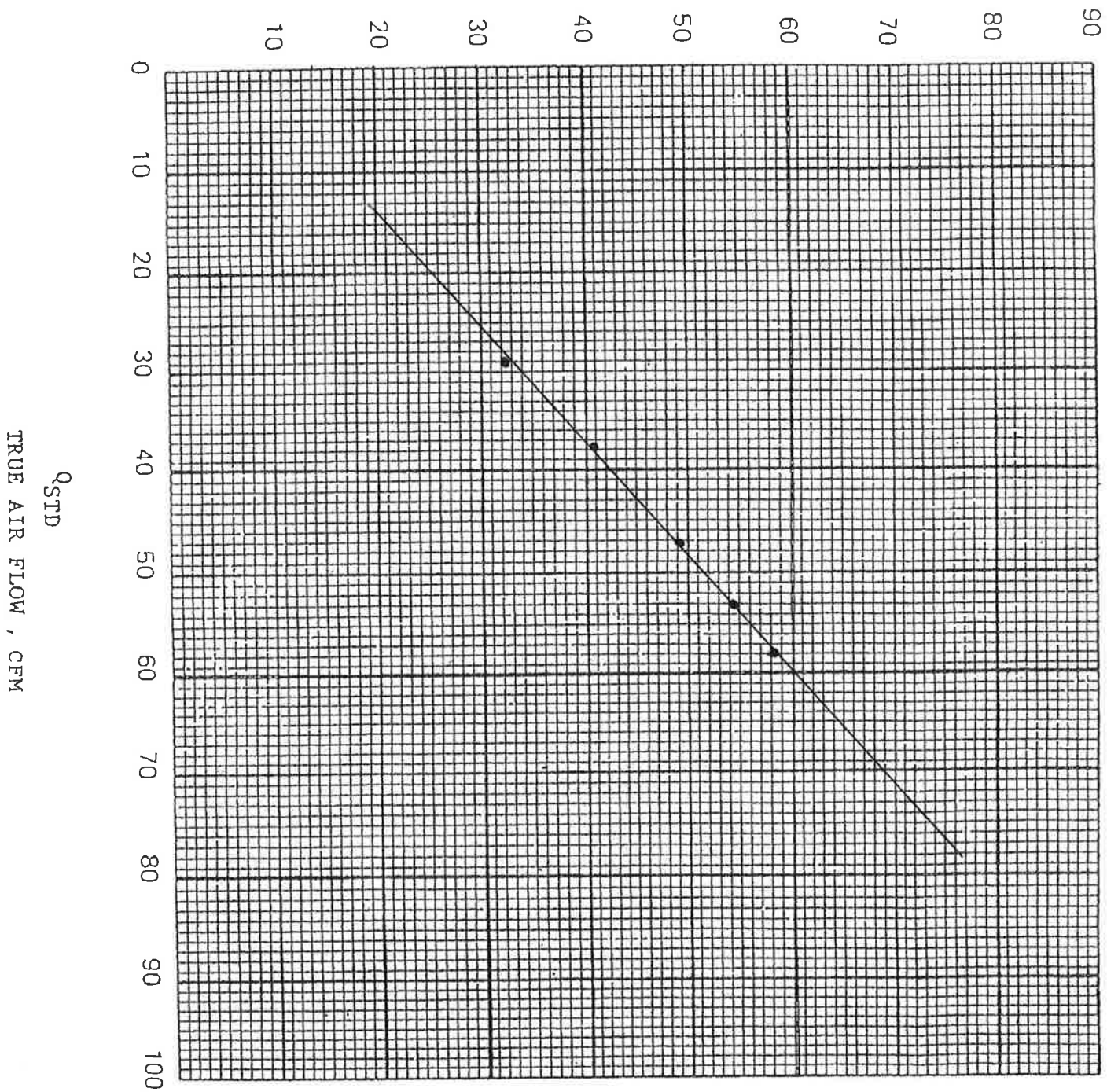
AKI
TFA810

60 CFM
1/8 in
Flow

7181 768-3333
Fax 718-305-0750
e-mail: info@stephens.com
www.stephens.com

$$I \cdot \sqrt{(P_2/P_{STD})(T_{STD}/T_2)}$$

OBSERVED FLOW METER READING , CFM



#22097P
6/30/11 GAH

Appendix H-2

Personal Air Monitoring

Personal Air Monitoring Summary Sheet (PAM's -Daily Analysis)

Report No. 1 June 4, 2012 - June 12, 2012

DuSable Park, Chicago, IL AECOM

Date Collected	Init	Sample ID	Flow Rate (lpm)	Total Time Sampled	Total Sample Volume (ml)	day after analysis							four day analysis						
						Analysis Date	Gross Counts (30 min)	Gross CPM	Bkg CPM	Net CPM	eff	Sample Concentration (uCi/ml)	Analysis Date	Gross Counts (30 min)	Gross CPM	Bkg CPM	Net CPM	eff	Sample Concentration (uCi/ml)
6/4/12	GH	D001	2.5	300	7.50E+05	06/05/12	13	0.43	0.47	0.00	0.243	0.00E+00	No 4 day analysis required						
6/4/12	KL	D002	2.5	300	7.50E+05	06/05/12	9	0.30	0.47	0.00	0.243	0.00E+00	No 4 day analysis required						
6/5/12	GH	D003	2.5	140	3.50E+05	06/06/12	18	0.60	0.47	0.13	0.243	1.38E-13	06/10/12	11	0.37	0.4	0.00	0.243	0.00E+00
6/5/12	KL	D004	2.5	445	1.11E+06	06/06/12	34	1.13	0.47	0.66	0.243	2.21E-13	06/10/12	10	0.33	0.4	0.00	0.243	0.00E+00
6/6/12	GH	D005	2.5	435	1.09E+06	06/07/12	15	0.50	0.3	0.20	0.243	6.82E-14	06/11/12	11	0.37	0.33	0.04	0.239	1.27E-14
6/6/12	KL	D006	2.5	435	1.09E+06	06/07/12	13	0.43	0.3	0.13	0.243	4.55E-14	06/11/12	10	0.33	0.33	0.00	0.239	0.00E+00
6/7/12	GH	D007	2.5	400	1.00E+06	06/08/12	22	0.73	0.37	0.36	0.243	1.35E-13	12/27/10	24	0.80	0.9	0.00	0.239	0.00E+00
6/7/12	KL	D008	2.5	400	1.00E+06	06/08/12	12	0.40	0.37	0.03	0.243	1.11E-14	12/27/10	24	0.80	0.9	0.00	0.239	0.00E+00
6/8/12	GH	D009	2.5	360	9.00E+05	06/11/12	10	0.33	0.33	0.00	0.243	0.00E+00	No 4 day analysis required						
6/8/12	KL	D010	2.5	360	9.00E+05	06/11/12	8	0.27	0.33	0.00	0.243	0.00E+00	No 4 day analysis required						
6/11/12	GH	D011	2.5	355	8.88E+05	06/12/12	26	0.87	0.4	0.47	0.243	1.95E-13	06/15/12	13	0.43	0.47	0.00	0.239	0.00E+00
6/11/12	KL	D012	2.5	355	8.88E+05	06/12/12	15	0.50	0.4	0.10	0.243	4.18E-14	06/15/12	10	0.33	0.47	0.00	0.239	0.00E+00
6/12/12	GH	D013	2.5	135	3.38E+05	12/21/10	9	0.30	0.37	0.00	0.243	0.00E+00	No 4 day analysis required						
6/12/12	KL	D014	2.5	135	3.38E+05	12/21/10	9	0.30	0.37	0.00	0.243	0.00E+00	No 4 day analysis required						

***Note: Samples with counts greater than background on day after analysis are analyzed again after 4 days to allow for radon / thoron progeny decay

Occupational Dose Limit for Occupational Radiation Exposure = 5 rem Total Effective Dose Equivalent

2000 DAC-Hours = 5 rem

DAC (Derived Air Concentration) for Th-232 = 5E-13uCi/ml

Administrative Site Limit for Occupational Exposure = 30% Th-232 DAC = 1.5E-13 uCi/ml

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
Glen Hulse	002-766	D001	6/4/12	9:50A	2:50p	300	2.5	750×10^{-15}
Ken Lee	002-675	D002	6/4/12	9:50A	2:50p	300	2.5	750×10^{-15}

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
D001	GAH	6/5/12	13	0	0.243	750×10^{-15}	0		
D002	GAH	6/5/12	9	0	0.243	750×10^{-15}	0		
4 day analysis									
AND 4 day required									

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/5/12 is 14 ^{cts}/_{30min} = 0.47cpm
date

30 minute background count for N/A is _____ cpm
date

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
Glen Huber	002-766	1003	6/5/12	8:10A	10:30A	140	2.5	3.50×10^5
Ken Lee	002-655	1004	6/5/12	8:10A	3:15p	445	2.5	1.11×10^6

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
1003	GAH	6/6/12	18	0.60	0.243	3.50×10^5	2.00×10^{-11}	1.37×10^{-11}	
1004	GAH	6/6/12	34	1.13	0.243	1.11×10^6	1.12×10^{-12}	2.21×10^{-13}	
4 day analysis									
1003	GAH	6/10/12	11	0	0.243	3.50×10^5	0		
1004	GAH	6/10/12	10	0	0.243	1.11×10^6	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/6/12 is 14 ^{30m}cpm ≈ 0.47 cpm
date

30 minute background count for 6/10/12 is 12 ^{30m}cpm ≈ 0.40 cpm
date

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
G. Hulse	002-675	D005	6/6/12	7:55A	3:10	4:35	2.5	1.09×10^6
K. Lee	002-766	D006	6/6/12	7:55A	3:10P	4:35	2.5	1.09×10^6

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM}) (1/\text{Eff.})}{(V) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
D005	GAH	6/7/12	15	0.2	0.243	1.09×10^6	6.80×10^{-14}		
D006	GAH	6/7/12	13	0.13	0.243	1.09×10^6	4.53×10^{-14}		
4 day analysis									
D005	GAH	6/11/12	11	0.03	0.243	1.09×10^6	1.25×10^{-14}		
D006	GAH	6/11/12	10	0	0.243	1.09×10^6	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/7/12 is 9 $\frac{\text{cts}}{\text{cpm}} / 30 \text{ min} = 0.30 \mu\text{Ci}$
date

30 minute background count for 6/11/12 is 10 $\frac{\text{cts}}{\text{cpm}} / 30 \text{ min} = 0.33 \mu\text{Ci}$
date

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
G. Huler	002-615	D007	6/7/12	8:10A	2:50p	400	2.5	1.00×10^6
K. Lee	002-766	D008	6/7/12	8:10A	2:50p	400	2.5	1.00×10^6

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM}) (1/\text{Eff.})}{(\text{V}) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
D007	GAH	6/8/12	22	0.36	0.243	1.00×10^6	1.34×10^{-13}		
D008	GAH	6/8/12	12	0.03	0.243	1.00×10^6	1.11×10^{-14}		
4 day analysis									
D007	GAH	6/12/12	9	0	0.243	1.00×10^6	0		
D008	GAH	6/12/12	11	0	0.243	1.00×10^6	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/8/12 is 11 $\frac{\text{cts}}{\text{epm}/30\text{min}} = 0.37 \text{ gpm}$
date

30 minute background count for 6/12/12 is 12 $\frac{\text{cts}}{\text{epm}/30\text{min}} = 0.40 \text{ gpm}$
date

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
G. Huber	002-615	0009	6/8/12	8:20A	2:20P	360	25	9.0×10^5
K. Lee	002-766	0010	6/8/12	8:20A	2:20P	360	25	9.0×10^5

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM}) (1/\text{Eff.})}{(\text{V}) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
0009	GAH	6/11/12	10	0	0.243	9.0×10^5	0		
0010	GAH	6/11/12	8	0	0.243	9.0×10^5	0		
4 day analysis									
* No 4 day required									

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/11/12 is 10 ^{cts}/_{30 min} = 0.33 _{cpm}
date

30 minute background count for N/A is _____ cpm
date

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
G. Hyle	002-625	D011	6/11/12	8:35A	2:30P	355	2.5	8.88×10^5
K. Lee	002-766	D012	6/11/12	8:35A	2:30P	355	2.5	8.88×10^5

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM})(1/\text{Eff.})}{(\text{V})(2.2 \text{ E} + 6 \text{ dpm/uCi})(\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) $\mu\text{Ci/ml}$	Background Activity (B) $\mu\text{Ci/ml}$	Actual Concentration $\mu\text{Ci/ml}$
D011	GAH	6/14/12	26	0.47	0.243	8.88×10^5	1.95×10^{-13}		
D012	GAH	6/12/12	15	0.1	0.243	8.88×10^5	4.17×10^{-14}		
4 day analysis									
D011	GAH	6/15/12	13	0	0.243	8.88×10^5	0		
D012	GAH	6/15/12	10	0	0.243	8.88×10^5	0		

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/12/12 is 12 $\frac{\text{cts}}{\text{cpm}} / 30 \text{ min} = 0.4 \text{ cpm}$
date

30 minute background count for 6/15/12 is 14 $\frac{\text{cts}}{\text{cpm}} / 30 \text{ min} = 0.47 \text{ cpm}$
date

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

$$\text{Volume (V)} = (\text{Pump liters/min.})(\text{Total Sample Time in minutes})(1000 \text{ ml/liter})$$

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)
G. Heiser	002-675	D013	6/12/12	8:20A	10:25A	135	2.5	3.38x10 ⁵
K. Lee	002-766	D014	6/12/12	8:20A	10:35A	135	2.5	3.38x10 ⁵

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{(\text{Net CPM}) (1/\text{Eff.})}{(\text{V}) (2.2 \text{ E} + 6 \text{ dpm/uCi}) (\text{filter retention factor})}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A) μCi/ml	Background Activity (B) μCi/ml	Actual Concentration μCi/ml
D013	GAH	6/13/12	9	0	0.243	3.38x10 ⁵	0		
D014	GAH	6/13/12	9	0	0.243	3.38x10 ⁵	0		
4 day analysis									
NO 4 day Analysis required									

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

30 minute background count for 6/13/12 is 11 cpm/30 min = 0.37cpm
date

30 minute background count for 6/18/12 is N/A cpm
date

Appendix I

Instrument Calibrations

Ludlum Model 2221/44-10 Calibration

Model 2221 serial number: 176944Probe 44-10 serial number: 098196Date: 11/8/11

Scaler Linear Check

Pulser model/serial number: Ludlum 500 1 # 159107Calibration Due Date: 1/27/12Threshold set to 100 mv. CB (tech. init.)

Pulser setting in cts.	Multiplier	As Found Scaler reading in cts.	After Adjustment Scaler reading in cts.
<u>400</u>	X1	<u>400</u>	<u>-</u>
<u>4K</u>	X10	<u>3999</u>	<u>-</u>
<u>40K</u>	X100	<u>39894</u>	<u>-</u>
<u>400K</u>	X1000	<u>399876</u>	<u>-</u>

Voltage Plateau

Source isotope/serial number: CS-137 0.894C
on 12/20/05 1 # 4830

BKGD PLATEAU

volts	Source counts	Bkg counts
<u>700</u>	<u>17129</u>	<u>936</u>
<u>750</u>	<u>23181</u>	<u>1593</u>
<u>800</u>	<u>26923</u>	<u>2513</u>
<u>850</u>	<u>29423</u>	<u>3034</u>
<u>900</u>	<u>31175</u>	<u>3806</u>
<u>950</u>	<u>32027</u>	<u>3820</u>
<u>* 1000</u>	<u>32881</u>	<u>4337</u>
<u>1050</u>	<u>33120</u>	<u>4687</u>

SOURCE PLATEAU

volts	Source counts	Bkg counts
<u>1100</u>	<u>33188</u>	<u>4627</u>
<u>1150</u>	<u>33390</u>	<u>4615</u>
<u>1200</u>	<u>34835</u>	<u>4772</u>

operating voltage selected: 1000 V

Ludlum Model 2221/44-10 Calibration

page 2 of 2

Model 2221 serial number: 176944Probe 44-10 serial number: 098196Date: 11/8/11window verified at about 3830**Instrument BKGD****1 minute BKDG counts**741370846804706670507084Average: 7083.5**Source Block Data**

Source block ID:

2013 - 5477A
2014 - 5477A
2015 - 5477A
2016 - 5477A**1 minute Source Block counts**252822569625452254772574225675Average: 25554 cpm Net Average: 18470.5 cpm**Activity Calculation**Net Average source count rate of: 18470.5 cpmdivided by 10 = 1847.05Times ^{7.1}7.2 = 13114.05 (A)Square root of (A) = 114.5 times 2 = 229.0 (B)(A) plus the average BKGD = 20197.6 CPM/^{7.1}7.2 pCiThe cutoff value is: 19969 (CPM/^{7.1}7.2 pCi minus (B))unshieldedCalibration performed by: [Signature]DATE: 11/8/11

Calibration approved by: _____

DATE: _____

w 6" shield

Ludlum Model 2221/44-10 Calibration

page 2 of 2

Model 2221 serial number: 176944

Probe 44-10 serial number: 098196

Date: 11/8/11

☒ window verified at about 3830

Instrument BKGD

1 minute BKDG counts

<u>2123</u>	<u>2137</u>
<u>2083</u>	<u>1938</u>
<u>2205</u>	<u>2232</u>

Average: 2119.7

Source Block Data

Source block ID: 2012-5417A

2012-5417A
2012-5417A
2012-5417A
2012-5417A

1 minute Source Block counts

<u>9213</u>	<u>9732</u>
<u>9506</u>	<u>9049</u>
<u>9438</u>	<u>9307</u>

Average: 9374.2 cpm Net Average: 7254.5 cpm

Activity Calculation

Net Average source count rate of: 7254.5 cpm divided by 10 = 725.45

Times 7.2 = 5150.7 (A)

Square root of (A) = 71.8 times 2 = 143.6 (B)

(A) plus the average BKGD = 7270.4 CPM/7.2 pCi

The cutoff value is: 7127 (CPM/7.2 pCi minus (B))

w 6" shield

Calibration performed by: [Signature]

DATE: 11/8/11

Calibration approved by: _____

DATE: _____

Ludlum Model 2221/44-10 Calibration

page 2 of 2

Model 2221 serial number: 176944Probe 44-10 serial number: 098196Date: 11/8/11window verified at about 3830**Instrument BKGD****1 minute BKDG counts**243725282521249124392456Average: 2478.7**Source Block Data**Source block ID: 201A-547A
2012-547A
2013-547A
201A-547A**1 minute Source Block counts**107991089410627110931083310911Average: 10859.5 cpm Net Average: 8380.8 cpm**Activity Calculation**Net Average source count rate of: 8380.8 cpm divided by 10 = 838.08Times ^{7.1}~~7.2~~ = 5950.4 (A)Square root of (A) = 77.1 times 2 = 154.2 (B)(A) plus the average BKGD = 8429.1 CPM/^{7.1}~~7.2~~ pCiThe cutoff value is: 8275 (CPM/^{7.1}~~7.2~~ pCi minus (B))unshielded w/ 25' cordCalibration performed by: GP/KDATE: 11/8/11

Calibration approved by: _____

DATE: _____



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER STAN HUBER CONSULTANTS

ORDER NO. 20188173/370349

Mfg. Ludlum Measurements, Inc. Model 14C

Serial No. 114750

Mfg. Ludlum Measurements, Inc. Model 44-9

Serial No. PR 112387

Cal. Date 10-Nov-11 Cal Due Date 10-Nov-12 Cal. Interval 1 Year Meterface 202-608

Check mark ☒ applies to applicable Instr. and/or detector IAW mfg. spec. T. 73 °F RH 24 % Alt 709.8 mm Hg

☐ New Instrument ☐ Instrument Received ☐ Within Toler. $\pm 10\%$ ☒ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical ck.

☒ Meter Zeroed

☐ Background Subtract

☐ Input Sens. Linearity

☒ F/S Resp. ck

☒ Reset ck.

☐ Window Operation

☒ Geotroplism

☒ Audio ck.

☐ Alarm Setting ck.

☒ Batt. ck. (Min. Volt) 2.2 VDC

☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 32 mV Det. Oper. 900 V at 32 mV Threshold Dial Ratio = mV

☐ HV Readout (2 points) Ref./Inst. 1 V Ref./Inst. 1 V

COMMENTS:

Eff for C14

Background = 50cpm

Reading = 16000cpm

Size = 229767 dpm

S/N = 1476-66

Eff 4pi = 6.9 %

Eff for Th230

Background = 50cpm

Reading = 600cpm

Size = 3220 dpm

S/N = 5020-03

Eff 4pi = 17 %

x1000 Range not cal'd

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 In which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X1000	1500mR/hr	NOT CAL'D	NOT CAL'D
X1000	500mr/hr	1	1
X100	500kcpm	5K	5K
X100	100kcpm	1K	1K
X 10	50kcpm	4.4K	5K
X 10	10kcpm	0.9K	1K
X 1	5kcpm	5.2K	5K
X 1	1kcpm	1.05K	1K
X0.1	500cpm	5.2K	5K
X0.1	100cpm	1K	1K

*Uncertainty within $\pm 10\%$ C.F. within $\pm 20\%$

All Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

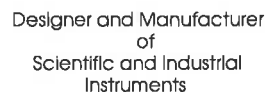
Reference Instruments and/or Sources: ☐ 73410 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646 ☐ 70897 ☐ Ra-226 S/N Y982
Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304
☐ Alpha S/N ☐ Beta S/N ☐ Other ☐ m 500 S/N 189509 ☐ Oscilloscope S/N ☒ Multimeter S/N 71300492

Calibrated By: Wendell Williams

Date 10-Nov-11

Reviewed By: Bob Hill

Date 10 Nov 11



LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Customer STAN HUBER CONSULTANTS Date 10-Nov-11 Order #. 20188173/370349

Model 14C Serial No. 114750 Detector Model 44-9 Serial No. PR 112387

Source CS/37 E 551 High Voltage 900 V

Input Sensitivity 32 mV

Signature: Gwendolyn Williams Date 10-Nov-11

Ludlum Model 2221/44-10 Calibration

page 1 of 2

Model 2221 serial number: 134542Probe 44-10 serial number: PR 168143Date: 11/8/11

Scaler Linear Check

Pulser model/serial number: Ludlum 500 1 # 159107Calibration Due Date: 1/27/12Threshold set to 100 mv. 6H (tech. init.)

Pulser setting in cts.	Multiplier	As Found Scaler reading in cts.	After Adjustment Scaler reading in cts.
<u>400</u>	X1	<u>400</u>	<u>-</u>
<u>4k</u>	X10	<u>4000</u>	<u>-</u>
<u>40k</u>	X100	<u>39997</u>	<u>-</u>
<u>400k</u>	X1000	<u>399959</u>	<u>-</u>

Voltage Plateau

Source isotope/serial number: CS-137 0.894C
on 12/20/35 1 # 4830

BKGD PLATEAU

volts	Source counts	Bkg counts
<u>700</u>	<u>25577</u>	<u>2192</u>
<u>750</u>	<u>28922</u>	<u>3090</u>
<u>800</u>	<u>30704</u>	<u>3604</u>
<u>850</u>	<u>31736</u>	<u>3740</u>
<u>900</u>	<u>31975</u>	<u>3825</u>
* <u>950</u>	<u>32234</u>	<u>3843</u>
<u>1000</u>	<u>32367</u>	<u>3897</u>
<u>1050</u>	<u>33160</u>	<u>3961</u>

SOURCE PLATEAU

volts	Source counts	Bkg counts
<u>1100</u>	<u>33704</u>	<u>4304</u>
<u>1150</u>	<u>35905</u>	<u>4654</u>
<u>1200</u>	<u>38724</u>	<u>5326</u>

operating voltage selected: 950 V

unshielded

Ludlum Model 2221/44-10 Calibration

page 2 of 2

Model 2221 serial number: 134542

Probe 44-10 serial number: PR 168143

Date: 11/8/11



window verified at about 3830

Instrument BKGD

1 minute BKDG counts

<u>6016</u>	<u>6108</u>
<u>5995</u>	<u>6062</u>
<u>6156</u>	<u>6157</u>
Average: <u>6082</u>	

Source Block Data

Source block ID: 2012-5417A
2012-5427A
2012-5437A
2012-5447A

1 minute Source Block counts

<u>24909</u>	<u>24669</u>
<u>24825</u>	<u>24720</u>
<u>24559</u>	<u>24846</u>
Average: <u>24755</u> cpm	Net Average: <u>18673</u> cpm

Activity Calculation

Net Average source count rate of: 18673 cpm

divided by 10 = 1867.3

Times $\sqrt{7.2}$ = 13257.8 (A)

Square root of (A) = 115.1 times 2 = 230.2 (B)

(A) plus the average BKGD = 19339.8 CPM $\sqrt{7.2}$ pCi

The cutoff value is: 19110 (CPM $\sqrt{7.2}$ pCi minus (B))

Calibration performed by: [Signature]

DATE: 11/8/11

Calibration approved by: _____

DATE: _____

w/6" shield

Ludlum Model 2221/44-10 Calibration

page 2 of 2

Model 2221 serial number: 134542

Probe 44-10 serial number: PR 168143

Date: 11/8/11

☒ window verified at about 3830

Instrument BKGD

1 minute BKDG counts

<u>1641</u>	<u>1664</u>
<u>1658</u>	<u>1645</u>
<u>1587</u>	<u>1670</u>
Average: <u>1644</u>	

Source Block Data

Source block ID: 2012-5447A

2012-5417A
2012-5427A
2012-5437A
2012-5447A

1 minute Source Block counts

<u>8867</u>	<u>8841</u>
<u>8759</u>	<u>8723</u>
<u>8848</u>	<u>8841</u>

Average: 8813 cpm Net Average: 7169 cpm

Activity Calculation

Net Average source count rate of: 7169 cpm

divided by 10 = 716.9

Times $\sqrt{7.1}$ = 5090 (A)

Square root of (A) = 71.3 times 2 = 142.6 (B)

(A) plus the average BKGD = 6734 CPM/ $\sqrt{7.1}$ pCi

The cutoff value is: 6591 (CPM/ $\sqrt{7.1}$ pCi minus (B))

6591
w/6" shield

Calibration performed by: [Signature]

DATE: 11/8/11

Calibration approved by: _____

DATE: _____



Stan A. Huber Consultants, Inc.
Health Physics and Radiation Safety Services

200 North Cedar Road – New Lenox, Illinois 60451-1751 – (800) 383-0468 or (815) 485-6161 – FAX (815) 485-4433 – Email sahci@sahci.com – Home Page www.sahci.com

Certificate of Calibration

Facility: **SAHCI**
City/State: **NEW LENOX IL**

Calibration Date: 5/22/2012

Manufacturer: **BICRON** Model No.: **MICRO REM L. E.** Serial No.: **C258C**

Instrument Identification: ☐ G-M ☐ ION CHAMBER ☐ POCKET DOSIMETER
Probe Type: ☐ PANCAKE ☐ END WINDOW ☐ SIDE WINDOW
Window: ☐ Open ☐ Closed ☒ Fixed

uR/hr
Internal TE
Scintillator

Calibration Sources

Cs-137 #1 ($\Gamma = 0.33$) 0.0948 mCi

Co-57 Efficiency Relative to Cs-137: 1 mR/hr = 8.4 cm

Cs-137 #2 ($\Gamma = 0.33$) 66.52 mCi

Co-57 ($\Gamma = 0.09$) 0.078 mCi

Observed 1000 μ R/hr (Co-57)
Actual 1000 μ R/hr (Co-57) $\times 100 =$ 100 %

All Sources as of Date: 5/7/2012

Scale Ranges	Distances Source #1	Distances Source #2	Actual μ R/hr	Observed μ R/hr	Within +/- 10%	Correction Factor
0.1	<i>electronic</i>	<i>97 cpm</i>	4	<i>4</i>	<i>YES</i>	-
	<i>pulsar</i>	<i>388 cpm</i>	16	<i>16</i>		-
1	<i>88.4 cm</i>	<i>97 cpm</i>	40	<i>40</i>		-
	<i>44.2 cm</i>	<i>3880 cpm</i>	160	<i>160</i>		-
10	<i>28.0 cm</i>		400	<i>400</i>		-
	<i>13.9 cm</i>		1600	<i>1600</i>		-
100	<i>8.8 cm</i>	<i>234.3 cm</i>	4000	<i>4000</i>		-
		<i>117.2 cm</i>	16000	<i>16000</i>		-
1000		<i>74.0 cm</i>	40000	<i>40000</i>		-
		<i>37.0 cm</i>	160000	<i>160000</i>		-

Angle of the flux field to detector (internal or external) is 90 degrees (perpendicular) and the distance is from center of source to center of detector, unless stated otherwise. Sodium iodide front end detectors are calibrated parallel to the flux field. All Sources used for calibrations are traceable to the National Institute Of Standards and Technology.

Source Set D Scales calibrated electronically with Pulser #142038 or #159107

Battery Check: 190 μ R/hr or uR/hr Operational Check: 200 μ R/hr using 10 mCi Cs-137 sig source

Comments: 160 uR/hr = 44.2 cm = 3880 cpm Input Amplitude = -3.0 volts

Next Calibration Date: May 7, 2013

Calibrated by: Joel M. Ahrweiler
Joel M. Ahrweiler PREV CALIBRATION 5/7/2012

Stan A. Huber Consultants, Inc.
200 North Cedar Road -- New Lenox, Illinois 60451
Phone (815) 485-6161 -- Fax (815) 485-4433

The information is for the identification of sources used in instrument calibrations performed by Stan A. Huber Consultants, Inc.

The following source set (A) is used by _____

Manufacturer	Radionuclide	Model No.	Serial No.	Activity	Assay Date
NAS	Cs-137	MED3550	35455	0.2051mCi	04-1-03
JL Shepherd	Cs-137	28-5	10223	78	08-23-97
Eckert & Ziegler	Co-57	RV-057-5M	1445-38-11	5.856 mCi	11-1-10
Isotope Products	Ba-133	RV-133-250U	970-72-15	253.5 μ Ci	06-01-03

The following source set (B) is used by _____

Manufacturer	Radionuclide	Model No.	Serial No.	Activity	Assay Date
Tech Ops	Cs-137	773	S823	155.4 mCi	03-11-92
North American Scientific	Cs-137	MED 3550	32697	0.209 mCi	02-01-03
Eckert & Ziegler	Co-57	RV-057-5M	1445-38-24	5.854 mCi	11-1-10
Isotope Products	Ba-133	RV-133-250U	970-72-17	259.9 μ Ci	06-01-03

The following source set (C) is used by _____

Manufacturer	Radionuclide	Model No.	Serial No.	Activity	Assay Date
Isotope Products	Cs-137	MED 3550	1047-24-3	0.199 mCi	04-01-04
Tech Ops	Cs-137	77302	S-575	147.4 mCi	09-17-86
Eckert & Ziegler	Co-57	RV-057-5M	1445-38-46	5.863 mCi	11-1-10
Isotope Products	Ba-133	RV-133-250U	970-72-19	254.8 μ Ci	06-01-03

The following source set (D) is used by JMA

Manufacturer	Radionuclide	Model No.	Serial No.	Activity	Assay Date
NEN	Cs-137	NES-356	3560379A-17	0.203 mCi	03-28-79
Tech Ops	Cs-137	773	S389	93.3 mCi	08-25-97
North American Scientific	Co-57	MED 3550	102862	6.208 mCi	09-1-07

Pulser

Manufacturer	Model No.	Serial No.
Ludlum	500	142038
Ludlum	500-2	159107

STAN A. HUBER CONSULTANTS, INC.
200 NORTH CEDAR ROAD, NEW LENOX, IL 60451-1751
PHONE (815)485-6161
Certificate of Calibration for Well Counter

6/1/12

FACILITY:
SAHCI

CITY:
New Lenox

STATE:
IL

INSTRUMENT IDENTIFICATION

MANUFACTURER: Ludlum MODEL #: 2200 SERIAL #: 130520
 MANUFACTURER: Ludlum MODEL #: 43-10 SERIAL #: PR113195

SOURCE IDENTIFICATION

MANUFACTURER: The Source MODEL # 94TH220 SERIAL # 2430
 ISOTOPE: Th-230 ACTIVITY: 20100 dpm DATE: 26-Aug-94

CHI-SQUARE DETERMINATION:

Certification Date: 1-Jun-12

COUNTS

1	4822
2	4983
3	4791
4	4922
5	4904
6	4933
7	4834
8	4853
9	4828
10	4898

$$\chi^2 = \frac{(n-1)s^2}{\bar{X}}$$

$$(n-1) = 9$$

$$s^2 = 3646$$

$$\bar{X} = 4877$$

$$\chi^2 = 6.7$$

The Chi-Square value 6.7 is between the values of 3.3 and 17.0 and is, therefore, acceptable.

EFFICIENCY DETERMINATION

QC Check

12 counts/30 minutes	Background 0.40 cpm	Total cpm 4877 cpm	20% 5852
			-20% 3901

NET CPM = TOTAL CPM - BKG CPM

%EFF = NET CPM / DPM * 100

4876 NET CPM

0.243 EFF

The Efficiency of the Detector is 0.243 or 24.3 %

LOWER LIMIT OF DETECTION (LLD)

$$LLD = \frac{2.71}{T_s} + 3.29 \sqrt{\left(\frac{C_b}{T_b}\right) \left(1 + \frac{T_b}{T_s}\right)} = \frac{2.71}{2} + 3.29 \sqrt{\left(\frac{0.4}{30}\right) \left(1 + \frac{30}{2}\right)}$$

LLD = 2.87 cpm or 11.8 dpm

C_b = Bkg CPM

T_s = Sample Count Time

T_b = Bkg Count Time

CALIBRATED BY: _____ NEXT CALIBRATION DATE: Jun-13
 Glenn Huber

Ludlum Model 2200 / 43-10 Calibration

Model 2200 Serial Number: 130520
Model 43-10 Serial Number: PR113195

Source Used: The Source
Th-230
20100 dpm
8/26/1994
#94TH220

Date: 6/1/2012

Voltage Plateau

Background Plateau

Volts	CPM
500	1
550	0
600	0
650	1
700	0
750	0
800	0
850	1
900	1
950	1
1000	3

Source Plateau

Volts	CPM
500	1089
550	2486
600	3842
650	4603
700	4855
750	4966
800	4926
850	4981
900	5061
950	4960
1000	4956

Operating Voltage Set at: 740 volts

Scaler Counts

Output	Reading - 1 minute count
40 cpm	40 cpm
400 cpm	400 cpm
4000 cpm	4006 cpm
40000 cpm	40055 cpm